AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 90)

JUNE 1971

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

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NASA SP-7011 (90)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 90)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during May, 1971.

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 454 reports, articles, and other documents announced during May 1971 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, irregular supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations and abstracts are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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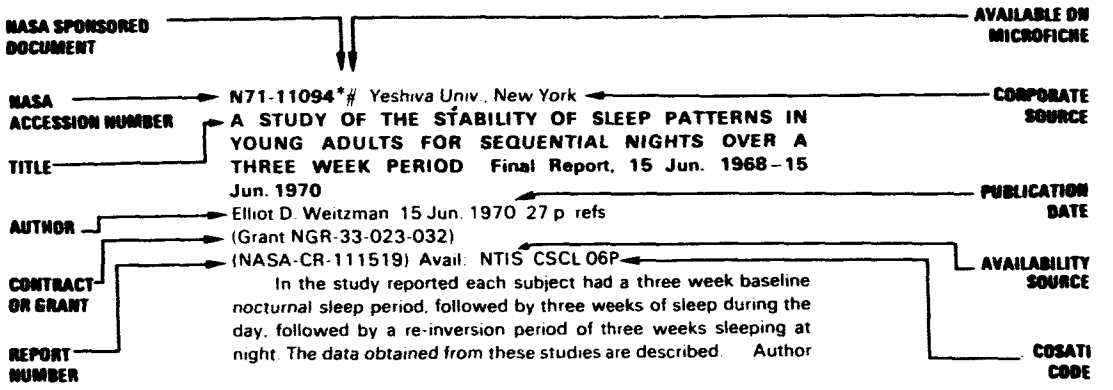

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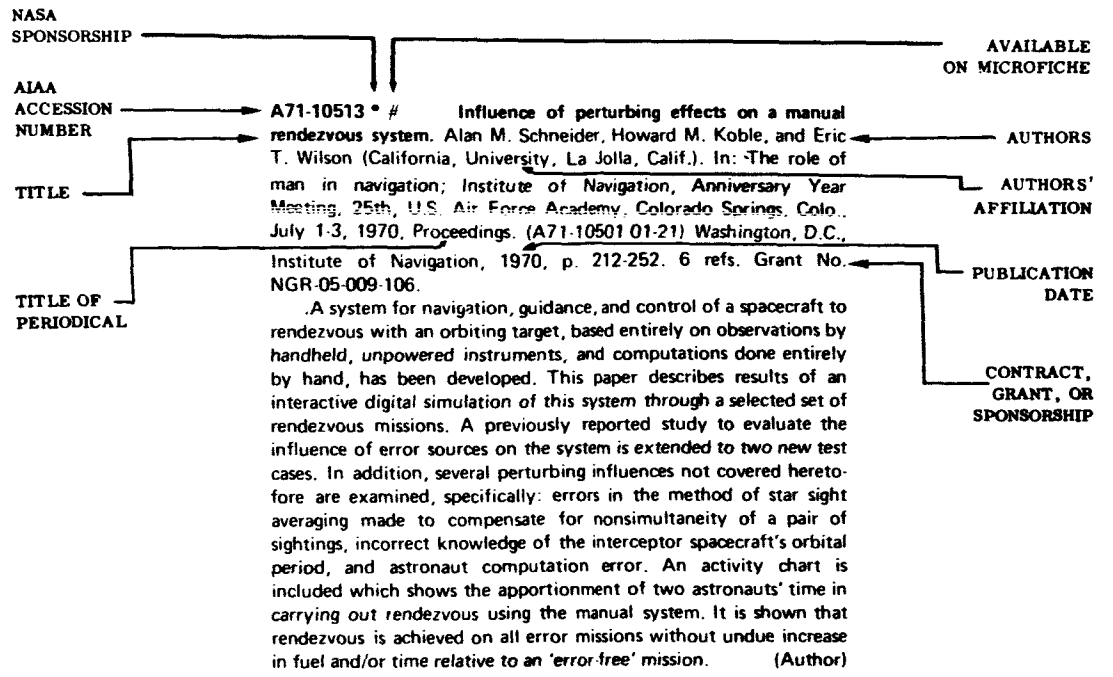

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 90) JUNE 1971

IAA ENTRIES

A71-22123 * **Interaction of the semicircular canals and the otoliths (O vzaimodeistvii polukruzhnykh kanalov i otolitov).** V. A. Kisliakov, M. M. Levashov, I. V. Oriov, and L. A. Semenov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Dec. 1970, p. 1731-1744. 28 refs. In Russian.

Study of the effect of centrifugal force (CFF) on the pigeon head nystagmus. It is found that CFF seems to act on the semicircular canals either indirectly via the system otoliths - nerve centers, or via a direct effect on the cupula mechanics. Either of the two effects is possible according to the value of the CFF, its variations with time, its direction along the longitudinal body axis, and according to the nystagmus-provoking stimulation. Changes of the rotatory and galvanic nystagmus thresholds result from the indirect CFF effect (via otoliths and nerve centers) on the nystagmus reflex arc. This influence is not necessarily inhibitory. During the caloric test, the direct CFF effect on the endolymphatic flows prevails. This effect is capable either of weakening or intensifying the endolymph displacement and even of reversing its direction. In this case, the central effect of the CFF is masked by a stronger 'peripheral' one, which results from peculiarities of the canal hydrodynamics in the CFF field. O.H.

A71-22124 # **Photochemical and bioelectrical processes in the retina after intensive pulsed photostimulation (Fotokhimicheskie i bioelektricheskie protsessy v setchatke posle intensivnoi impul'snoi fotostimuliatsii).** E. A. Obukhova and V. I. Shostak (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Dec. 1970, p. 1745-1749. 8 refs. In Russian.

Experimental study of rhodopsin dissociation in vitro and its regeneration in vivo, as well as the bioelectrical activity of the rabbit retina subjected to light flashes of different intensity. Only 50% rhodopsin was found to dissociate under the influence of such flashes. The initial delay of rhodopsin resynthesis occurs during the first five minutes of dark adaptation, after which there appears to be a close correlation between the photochemical processes and the restitution of the retina bioelectrical activity. O.H.

A71-22125 # **Contractile function of isolated papillary muscles of the left ventricle of rats acclimated to high altitude hypoxia (Sokratitel'naia funktsiia izolirovannykh papilliarnykh myshts levogo zheludochka serdtsa krys, adaptirovannykh k vysotnoi gipoksii).** V. I. Kapel'ko (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Dec. 1970, p. 1787-1793. 18 refs. In Russian.

Study of the contractile force of the left ventricular papillary muscles in rats subjected in a pressure chamber to a discontinuous adaptation to high altitudes. The maximum contractile force in rats adapted to an altitude of 6000 m for five hours a day for a period of six weeks was found to be higher by 30% as compared with that of control rats. This difference was more obvious at a high rate of contractions. The myocardium of adapted animals was more sensitive to tyramine. The adaptation of animals for two additional weeks to altitudes of 7000 m resulted in the disappearance of these functional differences as compared to the controls. O.H.

A71-22126 # **Phenomenological theory of functional control parameters of the oxygen transport system (K fenomenologicheskoi teorii funktsional'nykh parametrov regulirovaniia sistemy transporta kisloroda).** M. A. Khanin and I. B. Bukharov (Vsesoiuznyi Zaochnyi Mashinostroitel'nyi Institut, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Dec. 1970, p. 1801-1807. 12 refs. In Russian.

Discussion of a phenomenological theory of optimum functional parameters of the heart, lungs, and erythropoiesis, based on the principle of minimum losses associated with oxygen transport. A mathematical model for describing the functional state of the oxygen transport system is presented which determines the stationary values for the functional parameters of the oxygen transport system under different oxygen transport conditions. Using this model, optimum values for the erythrocyte concentration in blood, and for partial oxygen pressure in arterial blood are obtained and found to be in close agreement with those obtained empirically. As an example, the model is used to examine the adaptation to changes in the barometric pressure in permanent high-altitude residents. O.H.

A71-22131 • **Freeze-thaw behavior of a moderately halophilic bacterium as a function of salt concentration.** Paul H. Deal (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Cryobiology*, vol. 7, no. 2-3, 1970, p. 107-112. 17 refs.

A moderately halophilic bacterium was studied with respect to growth and survival after freezing and thawing at various cooling and warming rates and in various sodium chloride concentrations. Viability was dependent on cooling and warming rates and salt concentration. The combination of 20 C per min cooling, 400 C per min warming, and 10% salt yielded the highest survival. M.M.

A71-22192 # **Basic principles of cosmonaut selection (Obshchie polozheniia otbora kosmonavtov).** N. N. Gurovskii and T. N. Krupina. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 3-8. 18 refs. In Russian.

The bases for the selection of cosmonaut candidates in regard to psychological and physical fitness are shown to be laid down in the

main by the requirements of spaceflight. Three elimination stages in the selection process are pointed out: (1) the ambulant clinic examination designed to bring to light any counterindicating or disqualifying overt pathology and functional disturbances; (2) the comprehensive clinical survey at a hospital by a team of specialists, including psychiatrists and psychologists, administering exhaustive batteries of functional load and other tests designed to detect any covert pathology; and (3) the period of training, primarily aimed at developing the cosmonaut's spaceflight adaptations and capabilities, which also represents the ultimate stage in the selection of the fit. At certification time, special attention is paid to the degree and speed of adaptation to space environment demands displayed by candidates. M.V.E.

A71-22193 # **Experimental substantiation of acceptable radiation dosage during extended space flights (Eksperimental'noe obosnovanie dopustimykh doz radiatsii pri dlitel'nykh kosmicheskikh poletakh).** Iu. G. Grigor'ev, B. A. Markelov, V. I. Popov, A. A. Akhunov, A. V. Iliukhin, T. P. Tsessarskaia, A. V. Sedov, and V. A. Korsakov. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 9-14. 9 refs. In Russian.

Review of the results of a two-year study of a chronic exposure to gamma radiation of 204 dogs. Total mid-tissue doses absorbed were 42, 125 and 249 rads. Some of the animals were exposed for four months to repeated irradiations with doses of 8 and 42 rads, in addition to the chronic irradiation with a yearly dose of 62.5 rads. Dosage and exposure rates simulated irradiation that may occur on prolonged space flights. Hemopoietic, physiological, cytologic, and immunologic parameters were examined. By the end of the two-year experiment, some dogs which received maximal doses developed changes that can be characterized as early symptoms of chronic radiation injury. M.V.E.

A71-22194 # **Kidney patho-anatomy changes in dogs long after high-energy proton irradiation (Patologoanatomicheskie izmeneniia pochek u sobak v otdalennyi period posle obliucheniia protonami vysokikh energii).** B. S. Fedorenko, V. V. Shikhodyrov, N. I. Ryzhov, and D. Ia. Oparina. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 14-18. 13 refs. In Russian.

Renal pathologic anatomy in 17 dogs irradiated with 126 and 510 MeV protons at doses of 250, 350, and 550 rads was investigated 2 to 4 years after exposure. Dystrophic and sclerotic lesions were found in the glomerular and canalicular epithelium. The level of structural changes increased with the irradiation dose regardless of proton energy. These changes were slowly progressing and involved mainly vascular disorders and lesions of basal membranes. They resulted in sclerotic disturbances of glomeruli and adjacent tissues and were similar to developments involved in natural aging of the animal body. No specific features of proton exposure were observed. M.V.E.

A71-22195 # **Dynamics of morphologic changes in the supraoptic nucleus of the hypothalamus during prolonged transverse acceleration (Dinamika morfologicheskikh izmenenii v supraopticheskom iadre gipotalamusa pri dlitel'nom poperechno napravlennom uskorenii).** V. K. Podymov. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 18-23. In Russian.

Changes in the supraoptic nucleus of the hypothalamus of 45 white rats exposed to transverse accelerations for 3, 8, 16, and 24 hours were examined. Phase changes in secretory responses of supraoptic nuclei were found to indicate direct participation of secretory neurons of the hypothalamus in the adaptive reactions of the animal body to prolonged acceleration. M.V.E.

A71-22196 # **Dependence of the bioelectric activity in the hind limb antagonistic muscles on the rotation direction and head fixation of the animal (Zavisimost' bioelektricheskoi aktivnosti myshts-antagonistov zadnikh konechnostei ot napravleniia vrashcheniia i ot fiksatsii golovy zhivotnogo).** Iu. M. Ufland and S. B. Poliak. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 23-25. 7 refs. In Russian.

Right-to-left and left-to-right horizontal rotation of animals brought about an increase in bioelectric activity of antagonistic tibial muscles. The bioelectric reaction of the antagonistic muscles was found to be related to the animal's head fixation. The sural muscle reaction to rotation is also reviewed. M.V.E.

A71-22197 # **Medical support and main examination results of the Soyuz-9 spacecraft crew (Meditsinskoe obespechenie i osnovnye rezul'taty obsledovaniia ekipazha kosmicheskogo korablia 'Soiuz-9').** E. I. Vorob'ev, A. D. Egorov, L. I. Kakurin, and Iu. G. Nefedov. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 26-31. In Russian.

The medical support procedures applied to, and the physical examination results obtained from, the Soyuz-9 spacecraft crew are reviewed. The data obtained indicate that the physiological changes were of a transient or functional nature. The motor and autonomic systems displayed adaptive changes during the first 3-4 days. Post-flight shifts of vital physiologic systems were far more pronounced than in-flight changes. It seems that readaptation to the earth environment after prolonged exposure to weightlessness proceeds with greater difficulty and demands more manifest efforts from various physiological functions than adaptation to the weightless state. It is concluded that prolonged space missions make it necessary to develop preventive measures for alleviating post-weightlessness readaptation to the earth environment. M.V.E.

A71-22198 # **Methods for recording indices of astronauts' physiological functions (Metodika registratsii pokazatelei fiziologicheskikh funktsii u kosmonavtov).** A. G. Zerenin, I. V. Sokolov, V. A. Talavrinov, and I. S. Shadrintsev. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 32-35. 6 refs. In Russian.

Description of some features of the physiological monitoring instrumentation and procedures, applied to the Soyuz-9 mission, which made repeated putting on and taking off of the bioinstrumentation harness by the two crew members possible. These dressing and undressing operations, each lasting 5 to 10 min, were performed without any difficulty. The bioinstrumentation harness induced no unpleasant feelings or skin irritations. The telemetered data were of high quality and made it possible to accumulate reliable information on the condition of the cardiovascular and respiratory functions throughout the lengthy spaceflight. M.V.E.

A71-22199 # **Results of medical monitoring of the cosmonauts' condition throughout the Soyuz-9 spaceflight mission (Rezul'taty operativnogo meditsinskogo kontrolia za sostoianiem kosmonavtov vo vremia poleta na korable 'Soiuz-9').** A. A. Butusov, V. R. Liamin, A. A. Lebedev, A. P. Poliakova, I. B. Svistunov, V. A. Tishler, and A. P. Shulenin. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 35-39. In Russian.

Physiological changes induced by the 18-day spaceflight are described, along with the reactions to a provocative test involving a standard physical load. The high motor activity and emotional stress associated with the conduct of extensive scientific experiments seemed to elicit a lesser vagotonic reaction than those observed in previous manned spaceflights. This was suggested by the fact that in-flight heart and respiration rates were very similar to preflight values. The work capacity of the crew members remained high throughout the entire spaceflight duration. M.V.E.

A71-22200 # **Results of the clinical examination of astronauts A. G. Nikolaev and V. I. Sevast'ianov (Rezul'taty klinicheskogo**

obsledovaniia kosmonavtov A. G. Nikolaeva i V. I. Sevast'ianova). N. S. Molchanov, T. N. Krupina, V. A. Balandin, A. V. Beregovkin, M. M. Korotaev, N. A. Kuklin, E. T. Malyshkin, V. V. Nistratov, A. S. Panfilov, and V. M. Tolstov. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 39-42. In Russian.

Functional changes found are discussed and compared with those observed in crew members of previous space missions. In Soyuz-9 crew members, no pathological conditions were observed throughout the flight. Functional changes found were similar to those observed in previous flights. Observations recorded at the time of recovery included: skin pallor, moderate hyperemia of the upper airway mucosa, congestion of sclera vessels, eyelid edema, some muscular atrophy of the lower extremities, and decline in their tone. During the first post-flight day, a decrease of periosteal and tendon reflexes and an inhibition of abdominal reflexes were reported. Muscular pain that was noted on the first day grew by the fifth due to greater mobility. Statokinetic and sensomotor disorders were observed. Dynamic surveillance revealed that post-flight rehabilitation processes developed in a gradual manner. M.V.E.

A71-22201 # **Changes in the optical density of bone tissue and in the calcium metabolism of the astronauts A. G. Nikolaev and V. I. Sevast'ianov (Izmenenie opticheskoi plotnosti kostnoi tkani i metabolizma kal'tsiia u kosmonavtov A. G. Nikolaeva i V. I. Sevast'ianova).** E. N. Biriukov and I. G. Krasnykh. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 42-46. 14 refs. In Russian.

Results of pre- and postflight measurements of bone-tissue optical density and of the calcium content of blood serum and urine in the Soyuz 9 crew members Nikolaev and Sevast'ianov. Both astronauts exhibited an inflight increase of calcium excretion in the urine and decreased optical density of bone tissue. One of the astronauts showed a slightly increased calcium content in the blood serum during postflight examinations. After the flight, both the calcium excretion and the bone-tissue optical density levels rapidly returned to normal. The observed changes are related to the different functional requirements imposed on the skeletal-muscular system under weightlessness and gravity conditions. T.M.

A71-22202 # **Effects of space flight on the nervous-muscular system of astronauts (Vliianie kosmicheskogo poleta na nervno-myshechnyi apparat kosmonavtov).** M. A. Cherepakhin and V. I. Pervushin. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 46-49. 6 refs. In Russian.

Study of the effects of weightlessness on the muscular reflexes, tonus, and contractibility in Soyuz 9 astronauts. Medical observations were conducted for a month prior to the flight and for two days after recovery. Reflex excitability was measured by recording the bioelectrical activity of muscles participating in the tendon reflexes of extremities. The muscle tonus was assessed by muscle rigidity and bioelectric measurements. Exposure to the space flight conditions resulted in a decline of the force and tonus of posture muscles, increased reflex excitability of the nervous-muscular system, and reduced circumference of the lower extremities. T.M.

A71-22203 # **State of vertical-posture control in astronauts after an 18-day orbital flight (Sostoianie reguliatsii vertikal'noi pozy kosmonavtov posle 18-sutochnogo orbital'nogo poleta).** B. N. Petukhov, Iu. N. Purakhin, V. S. Georgievskii, V. M. Mikhailov, V. V. Smyshliaeva, and L. I. Fat'ianova. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 50-54. 21 refs. In Russian.

Study of the effects of weightlessness on the muscular control functions stabilizing the erect body posture in Soyuz 9 astronauts. Pre- and postflight measurements were conducted on a stabilographic platform which registered the frequency and amplitude of shifts in body center of gravity. The astronaut stood on the platform having his legs firmly planted and the head assuming inclined and erect positions with closed and opened eyes. The measured frequencies and amplitudes of shifts in body center of mass indicate significant postflight disturbances in the coordination system regulating the stability of the erect body posture. Additional measurements indicate disturbances in the control of cardiovascular functions. The causes for these disturbances are judged to originate from a reduced muscule tone and from changed interaction between various analyzers after space flight. The studied parameters resumed normal condition ten days after the flight. T.M.

A71-22204 # **State of the automicroflora of skin tissues and certain natural immunity indices in the astronauts A. G. Nikolaev and V. I. Sevast'ianov before and after flight (Sostoianie automikroflory pokrovnykh tkanei i nekotorykh pokazatelei estestvennogo immuniteta kosmonavtov A. G. Nikolaeva i V. I. Sevast'ianova do i posle poleta).** S. N. Zaloguev, M. M. Shinkareva, and T. G. Utkina. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 54-59. 10 refs. In Russian.

Results of microbiological and immunological examinations of the Soyuz 9 astronauts, conducted to determine changes in the composition of skin-tissue microflora and in the natural immunity level after an 18-day orbital flight. Post-flight examinations revealed substantial changes in the automicroflora of skin tissues. Large amounts of grampositive nonspore-forming bacteria which were not seen in pre-flight examinations were revealed on the dorsal skin tissues. No changes were seen in the microorganisms of oral and pharynx cavities, but microbe contents in the nasal cavities exceeded pre-flight levels. Test data are given for the effects of different antibiotics on staphylococcus samples from different skin regions. The lysozyme content in the saliva and the phagocytic activity of neutrophils in the blood were also measured. T.M.

A71-22205 # **Crew diet of the Soyuz 9 spacecraft (Ratsion pitaniia ekipazha kosmicheskogo korablia 'Soiuz-9').** V. P. Bychkov, V. A. Guda, V. P. Efimov, S. Kalandarov, and N. D. Radchenko. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 59, 60. In Russian.

Description of the food diet (including products and packaging) consumed by the Soyuz 9 crewmembers. The mean daily diet consisted of 853 g water, 139 g protein, 88 g fats, and 345 g carbohydrates, with an overall caloric value of 2803 Cal. The diets were supplemented with essential amino acids, and contained normal concentrations of other irreplaceable nutrients. T.M.

A71-22206 # **Influence of space flight on the state of the enzyme secretion function of the digestive system in astronauts (Vliianie kosmicheskogo poleta na sostoianie fermentovydelitel'noi funktsii pishche varitel'noi sistemy kosmonavtov).** K. V. Smirnov, L. S. Potemkina, L. G. Goland, N. P. Goncharova, R. A. Semenova, and V. I. Legen'kov. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 61-65. 21 refs. In Russian.

The digestive system's enzyme secretion function in Soyuz 9 crewmembers was studied indirectly before and after flight by measuring the activity of enzymes in the saliva, blood, urine, and feces. Post-flight examinations revealed an inhibition of the salivary glands and increased activity of proteolytic enzymes in the abdomen and pancreas. No significant changes in the small intestine were observed. The observed functional disturbances of the gastrointestinal tract are adaptive and indicate a response of the digestive system to weightlessness. T.M.

A71-22207 # **Results of an otorhinolaryngological investigation of Soyuz 9 spacecraft's crew members (Rezul'taty otorinolaringologicheskogo obsledovaniia chlenov ekipazha korablia 'Soiuz-9').** I. I. Brianov, F. M. Iuganov, I. Ia. Iakovleva, and I. M. Arzhanov. *Kosmicheskaia Biologiia i Meditsina*, vol. 4, Nov.-Dec. 1970, p. 65-68. 10 refs. In Russian.

Study of the physiological reactions of the vestibular and

auditory analyzers in Soyuz 9 crew members before, during, and after an 18-day orbital flight. Inflight effects noticed by the astronauts and the results of dynamic clinical postflight examinations show that the complex effects of space flight did not cause any pathological changes in the otorhinolaryngological organs of both astronauts. The inflight adaptation process had a clearly individual aspect in both astronauts, and the causes of certain inflight reactions are described. Three days after landing, the vestibulo-vegetative, vestibulo-sensory, and vestibulo-somatic reactions returned to the preflight pattern and revealed no asymmetries. T.M.

A71-22208 # **Orthostatic tolerance dynamics in astronauts after flight on the Soyuz 9 spacecraft (Dinamika ortostaticheskoi ustoichivosti kosmonavtov posle poleta na kosmicheskom korable 'Soiuz-9').** V. V. Kalinichenko, V. A. Gornago, G. V. Machinskii, M. P. Zhegunova, Iu. D. Pometov, and B. S. Katkovskii. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 68-77. 16 refs. In Russian.

Study of changes in the responses of cardiovascular and respiratory systems to orthostatic effects after an 18-day orbital flight in the Soyuz 9 spacecraft. Active and passive orthostatic tests were performed with the crewmembers for a month prior to the flight and in different post-flight periods. Active tests involved measurements of cardiac contraction rates and arterial pressures in reclining, sitting, and standing positions. Passive tests comprised measurements of EKG and arterial sphygmogram patterns, carbon dioxide expiration and alveolar content, and pulmonary ventilation in various body positions after breathing a special mixture. Tables show the results of the hemodynamic, gas-exchange, and external respiration measurements. Both astronauts exhibited a post-flight decline of orthostatic tolerance which recovered slowly and non-monotonically. T.M.

A71-22209 # **Influence of prolonged confinement in a Soyuz 9 spacecraft simulator on the functional state of the human cardiovascular system (Vliianie dlitel'nogo prebyvaniia cheloveka v makete korablia 'Soiuz-9' na funktsional'noe sostoianie serdechno-sosudistoi sistemy).** L. P. Salmanov, V. P. Dzedzichek, V. A. Tishler, N. E. Panferova, Iu. V. Latova, and T. G. Popova. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 78-81. 5 refs. In Russian.

The functional state of the cardiovascular system was studied in subjects confined from 19 to 23 days in a Soyuz 9 spacecraft simulator and subjected to normal and altered work-sleep cycles. The altered cycle involved a 7-hr shift in the circadian rhythm. Measurements involved cardiac contraction frequencies, systolic and diastolic pressures, and cardiac stroke and minute volumes. No changes were observed in the circulation system of subjects undergoing a normal work-sleep regimen, but substantial circulatory disturbances were experienced by subjects with the altered cycle. T.M.

A71-22210 # **EEG and behavioral reaction changes under the influence of acute hypoxia (Izmeneniia EEG i povedencheskikh reaktsii pri deistvii ostroi gipoksii).** N. A. Agadzhanian, I. Dvorzhak, L. V. Kaliuzhnyi, M. Moravek, and Ia. Tsmiral. *Kosmicheskaia Biologiia i Meditsina,* vol. 4, Nov.-Dec. 1970, p. 81-87. 10 refs. In Russian.

Experimental study of the effects of acute hypoxia on the EEG patterns and behavioral reactions of humans and animals. Changes in the EEG patterns from the visual cortex region, hypothalamus, and hippocampus of restrained and freely moving rabbits were measured together with changes in conditional reflexes during rapid onset of hypoxia (25 m/sec ascent rate to an equivalent height of 11,000 m). Tests with humans involved changes in the physiological reactions of the organisms during breathing of pure nitrogen, helium, or oxygen-poor mixtures. Measurements comprised EEG and EKG patterns, respiration volumes and rates, and motor reactions (writing tests). Graphical data illustrate changes in the body functions during hypoxia. T.M.

A71-22214 # **The influence of the semicircular canals on the otolith reactions (Vliianie polukruzhnykh kanalov na otolitovye refleksy).** L. A. Semenov and A. N. Dolotovskii (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 56, Nov. 1970, p. 1546-1553. 17 refs. In Russian.

Experimental study carried out in pigeons to examine the feasibility of interactions between the semicircular canals and the otoliths. The caudal shift of the otoliths during linear horizontal accelerations was found to evoke the contraction of the m. levator coccygei, whereas the rostral shift evoked the contraction of the m. depressor coccygei. This reaction ceases if the linear acceleration decreases to 0.2 g. This level considerably diminishes (to 0.03 g) after cessation of the inhibitory influence of the semicircular canals on the otolith reaction. O.H.

A71-22215 # **Change of the bioelectrical activity in the visual system and the anterior ectosylvian gyrus of the cat during vestibular stimulation (Izmenenie bioelektricheskoi aktivnosti v zritel'noi sisteme i v perednei ektosil'vievoi oblasti kory koshki pri vestibuliarnom razdrazhenii).** V. F. Meshman (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 56, Nov. 1970, p. 1570-1578. 26 refs. In Russian.

Study of the effect of vestibular stimulation on the background electrical activity and evoked responses in the retina, optic tract, lateral geniculate body, primary visual cortex, and the anterior ectosylvian gyrus in cats curarized or anesthetized with nembutal. The results obtained were found to be analogous for both curarized and anesthetized animals for any combination of intensity of light flashes and vestibular stimulation. In the visual system, the background electrical activity changed in a different manner, and the evoked responses to single and rhythmical light flashes and electrical stimulation of the optic tract fibers either diminished or increased. The frequency and range of these changes increased along the visual afferent pathways from the retina to the visual cortex. In the anterior ectosylvian gyrus, the background electrical activity and evoked responses to light flashes changed in the same direction during vestibular stimulation. O.H.

A71-22216 # **A biotelemetric method for contactless recording of animal movements (Biotelemetricheskii metod beskontaktnoi registratsii dvizhenii zhivotnykh).** V. G. Sharonin. *Fiziologicheskii Zhurnal SSSR,* vol. 56, Nov. 1970, p. 1645-1647. In Russian.

Description of a new method and device for contactless recording and quantitative analysis of the movement activity of biological objects, based on the application of centimeter-band standing waves. Using this method, field pattern variations of standing waves, originating in a waveguide, are recorded in the area between the biological object and the emitter of a high-frequency electromagnetic field. A schematic diagram of the measuring device is presented. Results obtained by using this technique with rats are discussed. O.H.

A71-22252 **Processing and stereophonic presentation of physiological signals.** Stephen B. Fine, Martin H. Graham, and Charles Süsskind (California, University, Berkeley, Calif.). *IEEE Transactions on Bio-Medical Engineering,* vol. BME-18, Jan. 1971, p. 9-15. 16 refs. Research supported by the California State Department of Mental Hygiene.

Description of an electroencephalophone (EEP) which presents

an effective stereophonic display of four channels of EEG, each from one quadrant of the skull. The signals from the two front quadrants are represented by a single tone whose pitch varies about a center frequency of 1250 Hz and which appears to move laterally in auditory space. The signals from the two occipital quadrants are similarly represented about center frequency of 700 Hz, so that they are readily distinguished from frontal activity. All channels are played through a single pair of headphones. The left headphone represents the combined activity of the two left-hand quadrants; the right headphone, of the two right-hand quadrants. The scheme may be used to supplement conventional graphic EEG records; under special conditions it may replace them altogether. M.M.

A71-22253 Some statistical properties of the visual evoked potential in man and their application as a criterion of normality. John R. Bennett, John S. MacDonald, Stephen M. Drance, and Kenshireo Uenoyama (British Columbia, University, Vancouver, Canada). *IEEE Transactions on Bio-Medical Engineering*, vol. BME-18, Jan. 1971, p. 23-33. 28 refs. National Research Council Grant No. A-3350; Medical Research Council Grant No. MA-2264.

A computer-aided visual inspection technique is used to extract and measure the 12 parameters corresponding to the amplitude and latency of the six peaks characterizing the average visual evoked potential (VEP) from the responses of 50 subjects. It is then demonstrated that each of these parameters is approximately individually Gaussian distributed and their means and variances are found. With this information, a simple statistical model for the normal VEP is constructed. It is next assumed that the same 12 parameters are jointly Gaussian distributed and the correlation matrix is computed. A principal component analysis is then applied to this matrix and it is found that the 12 correlated VEP parameters can be transformed into a reduced set of four uncorrelated components accounting for approximately 76% of the total variance of the original set. The correlation between these components and the original 12 parameters is found to reveal interesting aspects of the VEP pattern behavior. M.M.

A71-22254 • A digital parameter-identification technique applied to biological signals. Charles S. Burrus, Thomas W. Parks (Rice University, Houston, Tex.), and Thomas B. Watt, Jr. (Baylor College of Medicine, Houston, Tex.). *IEEE Transactions on Bio-Medical Engineering*, vol. BME-18, Jan. 1971, p. 35-37. 5 refs. Research supported by the U.S. Veterans Administration; PHS Grant No. GE-05435; Grant No. NGL-44-006-033.

A numerical procedure that shows promise as a parameter-identifying scheme is presented. The procedure is simple enough to allow real-time analysis on a small high-speed computer. Results of application to simulated and real blood-pressure curves are presented and discussed. (Author)

A71-22255 # Jury ratings of complex aircraft noise spectra versus calculated ratings. R. J. Wells (GE Research and Development Center, Schenectady, N.Y.). *Acoustical Society of America, Meeting, 80th, Houston, Tex., Nov. 3-6, 1970, Paper.* 30 p. 5 refs.

Comparison of a number of tape recordings of actual aircraft engine noise with a synthetic broadband noise approximating that of a pure jet. The noise spectra generated acoustically were also measured and compared with the electrical spectra. Parallel analyses were carried out assuming that the spectra as heard by the jurors were accurately represented by the measured spectra, and that the electrical spectra more closely approximated what the jurors really heard, especially in view of certain tone definition difficulties. F.R.L.

A71-22261 # An adequate mathematical model of interrelationship of basic hemodynamic parameters of the brain. N. P. Mitagvariia. *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 60, Dec. 1970, p. 697-700. 9 refs. In Georgian, with abstract in English.

Use of the results of pressure measurements in the aorta, the circle of Willis, and the venous sinuses of the brain to develop a mathematical model for determining the hemodynamic resistance of the blood. With the aid of this model the hemodynamic resistance is determined quantitatively in the major arteries (internal carotid and vertebral arteries) and integrally in the pial and smaller arteries of the brain. The results obtained with the aid of this model are shown to be statistically reliable. A comparison of these results with those obtained from direct experimental measurements shows a high degree of adequacy of the model vis-à-vis the object modeled. A.B.K.

A71-22262 # Ultrastructural and certain histochemical features of the myocardium during hypoxic hypoxia (Ul'trastrukturnye i nekotorye gistokhimicheskie osobennosti miokarda pri gipoksicheskoi gipoksii). Z. G. Tsagareli (Akademiia Nauk Gruzinskoi SSR, Institut Eksperimental'noi Morfologii, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 60, Dec. 1970, p. 733-736. 9 refs. In Russian.

Study of the ultrastructural organization of the myocardium in dogs, and comparison of these indices with histochemical and enzymatic features of the heart muscle under conditions of hypoxic hypoxia of various durations. Changes of a compensatory-dystrophic nature are found to develop in the heart muscle under conditions of hypoxic hypoxia. Moreover, the changes occurring in the case of repeated exposure of the animals to conditions of hypoxic hypoxia are more widespread and more serious than the changes occurring during a brief exposure. Apparently, the factor of duration of exposure is of decisive importance in the pathogenesis of the development of hypoxic damage to the heart. A.B.K.

A71-22263 # Functional and morphological state of the stomach during stress reactions (Funktsional'noe i morfologicheskoe sostoianie zheludka pri stress-reaktsiiakh). B. Kh. Rachvelishvili and V. R. Maisaia (Tbilisskii Gosudarstvennyi Meditsinskii Institut, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 60, Dec. 1970, p. 745-748. In Russian.

Study of the secretory function of the stomach and histomorphological alterations in the gastromucosa of dogs subjected to various stressors. A number of regular alterations are noted in dogs subjected to cranial and brain traumas, leading to the conclusion that stressor reactions are nonspecific and occur via the vagus nerve. A.B.K.

A71-22271 # Synchronous combinative time-pulse polylogical elements (Sinkhronnye kombinatsionnye vremia-impul'snye polilogicheskie elementy). A. P. Vishnevskii (Akademiia Nauk SSSR, Institut Matematiki, Novosibirsk, USSR). *Akademiia Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seriia Tekhnicheskikh Nauk*, Oct. 1970, p. 86-95. 54 refs. In Russian.

Discussion of the principle and realization of some advanced circuit designs for a class of synchronous polylogical structural elements facilitating a computer simulation of the functions of human neurons. Time-pulse coding techniques are considered for the vectors of function images represented by such polylogical elements. A block diagram of a synchronous combinative polylogical element is given, including an adder, an input signal converter, a coincidence circuit, a trigger, and a shaper. The complexity and efficiency of diode and triode polylogical circuits of this class are evaluated. Approaches to their microminiaturization are considered. V.Z.

A71-22357 • Biomechanical studies in aerospace physiology. Max Anliker (Stanford University, Stanford, Calif.) and John Billingham (NASA, Ames Research Center, Biotechnology Div., Moffett Field; Stanford University, Stanford, Calif.). *IEEE Spec-*

trum, vol. 8, Mar. 1971, p. 64-72. 28 refs.

Study of the behavior of the cardiovascular and vestibular systems in an aerospace environment. The cardiovascular system is significantly affected by the stresses of the aerospace environment, and particularly by the alterations in force fields encountered during weightlessness and the high accelerations associated with the maneuvers of aerospace vehicles. In the aerospace environment many types of disorientation occur in situations where the imposed force characteristics are outside the response capabilities of the vestibular system. It is considered to be possible that space sickness is the result of a sensory conflict for situations involving body movement, but now occurring sometimes without movement. F.R.L.

A71-22421 # **Investigation of age characteristics of the human crystalline lens (Issledovanie prozrachnogo khrustalika cheloveka v vozrastnom aspekte).** B. S. Kasavina and V. M. Akkuev (Moskovskii Nauchno-Issledovatel'skii Institut Glaznykh Boleznei, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 71, Jan. 1971, p. 28-31. 10 refs. In Russian.

Biochemical investigation of the protein and lipoid part of the crystalline lens of man in the age span from 21 to 115 years. In water soluble proteins of the total crystalline lens, its cortex and nucleus, four crystallins were found which have markedly different molecular weights and are not homogeneous. With increasing age, the accumulation of cholesterol is more marked in the lens nucleus. The content of cholesterol bound with proteins of the lens is known to be directly proportional to the moleculer weight of the crystallins. O.H.

A71-22459 **Techniques in clinical physiology: A survey of measurements in anesthesiology.** Edited by J. W. Bellville and C. S. Weaver (Stanford University, Stanford, Calif.). London, Collier-MacMillan, Ltd., 1969. 542 p. 607 refs.

A book describing methods, techniques, and instrumentation for many physiologic and pharmacologic studies, particularly those of the cardiovascular and respiratory systems, is offered as a reference volume for clinical physiologists, anesthesiologists, and biomedical engineers. Basic electronics is treated first, inasmuch as physiologic data are often transduced into electromagnetic form for ease of processing. ECG analysis is dealt with, together with newly developed research techniques. Techniques for measuring blood pressure, cardiac function, and respiratory mechanics are investigated, together with gas analysis and blood gas analysis, with indications of clinical applications. Other topics treated are glass electrodes used to measure divalent cations, and gas chromatographic and fluorometric analytic techniques for determining drug concentration. Tape recorders, display devices, and computers are also treated. M.M.

A71-22472 * **Mechanism of changes in brain norepinephrine metabolism after ovariectomy.** F. Anton-Tay, S. M. Anton, and R. J. Wurtman (MIT, Cambridge, Mass.). *Neuroendocrinology*, vol. 6, 1970, p. 265-273. 10 refs. PHS Grant No. AM-11237; Grant No. NGR-22-009-272.

Oophorectomy accelerates the turnover of (3)H-norepinephrine (3H-NE) in rat brain, but does not decrease endogenous brain norepinephrine content. If ovariectomized rats are treated with a given dose of alpha-methyl para-tyrosine (alpha-MPT), an inhibitor of norepinephrine synthesis, brain norepinephrine levels do not fall to the same extent as in unoperated animals given the same dose of alpha-MPT, even though the turnover of brain (3)H-NE continues to be accelerated. These data indicate that ovariectomy increases brain norepinephrine synthesis, and also decreases the sensitivity of rats to inhibitors of norepinephrine synthesis such as alpha-MPT. M.M.

A71-22475 # **Alteration of the electroencephalogram during bromotrifluoromethane exposure.** Ethard W. Van Stee, Kenneth C. Back, and R. Barry Prynn (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB; Ohio State University, Columbus, Ohio). *Toxicology and Applied Pharmacology*, vol. 16, 1970, p. 779-785. 11 refs. (AMRL-TR-69-14)

Results of a search for alterations in brain-wave patterns in dogs and monkeys which could be correlated with the apparent CNS depression associated with bromotrifluoromethane. The most significant findings were dominance of the EEGs by 6 to 9 Hz waves beginning 2 to 3 min after the start of exposure, and a nearly normal susceptibility of the EEG to activation by auditory and photic stimuli during exposure. F.R.L.

A71-22476 * **Primate restraint system for studies of metabolic responses during recumbency.** Wayne H. Howard, James W. Parcher, and Donald R. Young (NASA, Ames Research Center, Biomedical Research Branch, Moffett Field, Calif.). *Laboratory Animal Science*, vol. 21, no. 1, 1970, p. 112-117. 6 refs.

A system was devised to restrain primates, seemingly without adverse effect on the animal. The system provides a means for study of bone resorption and calcium metabolism in monkeys, and would be useful for other kinds of studies requiring restraint alone or with recumbency. (Author)

A71-22480 # **Nature of the early stage of cerebrospinal reflex suppression during blood circulation disorders (K voprosu o prirode nachal'nogo ugneteniia spinnomozgovykh refleksov pri narusheniiakh krovoobrashcheniia).** G. G. Kosheleva (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema*, no. 10, 1969, p. 37-44. 29 refs. In Russian.

Experiments were carried out on decerebrated, spine-incapacitated and intact rabbits and cats to investigate the causes of the onset of knee and flexor reflex suppression during blood circulation disorders. The abdominal aorta of the animals was stimulated or clamped and their femoral artery was stimulated to upset the blood circulation. Oscillograms are given and diagrams are plotted to show the changes in afferent impulsation after clamping the abdominal aorta and the changes in the flexor reflex due to the stimulation of both the abdominal aorta and the femoral artery. V.Z.

A71-22481 # **Function and metabolic activity of individual fractions of cerebral lipids (Funktsiia i metabolicheskaia aktivnost' otdel'nykh fraktsii lipidov golovnogo mozga).** M. I. Prokhorova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema*, no. 10, 1969, p. 71-78. 46 refs. In Russian.

The relation between the physiological functions and metabolism of individual cerebral lipid fractions was studied in three week old and adult albino rats by using tagged acetate molecules with a carbon isotope to observe metabolic processes. The whole fraction of lipids was extracted according to Ressiter and Palmer (1965) and the individual subfractions of phospholipids were then separated by adsorption on silica gel films according to Skidmore and Entenman (1962). Individual ganglioside subfractions were extracted according to Morrison and Smith (1964) from their mixture obtained according to Svennerholm (1956). Tables are given to illustrate the metabolism of cerebrosides, cholesterol, phosphatidyl-serine, phosphatidyl-choline, phosphatide acid, gangliosides and glycerides in the cerebrum of the experimental rats. V.Z.

A71-22482 # **Rates of conversion of glycine into serine, aspartate and glutamate in the cerebrum under normal and hypoxia conditions (Intensivnost' prevrashcheniia glitsina v serin, aspartat i glutamat mozga v norme i pri gipoksii).** L. I. Zakharova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema*, no. 10, 1969, p. 103-107. 24 refs. In Russian.

Conversion of glycine into serine, aspartate and glutamate was studied in the brain of albino rats after exposure to 90 mm Hg

pressure for 1 min, using glycine with C isotope for tagging. The rates of conversion of glycine into serine were higher than the rates of its conversion into aspartate and glutamate, in both experimental and control rats. All rates were generally lower over periods of 15 to 30 min after exposure to hypoxia and recovered by the 60th min. V.Z.

A71-22483 # **Dynamics of operator performance (K voprosu o dinamike rabotosposobnosti operatora).** V. S. Aver'ianov and K. S. Tochilov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 113-123. 13 refs. In Russian.

The performance of human operators was tested on an experimental control desk with light field variations effectuated according to special programs designed to confront the operators with diversified control problems of various complexity and sophistication. The heart beat, the biopotentials, the cutaneogalvanic reflex, and respiration rates of the operators were recorded and their performance was rated in an attempt to determine the effects of training and fatigue when the operators were instructed to solve repeatedly the same control problem programs ten times in a row. Also determined was the threshold flicker frequency during transition from flickering to continuous light after the test. Curves are plotted for time requirements and motor-logical error dynamics in the process of solving various test programs by the subjects. V.Z.

A71-22484 # **Memory problem for supraintensive stimuli and the adjustment reflex necessary (Problema pamiati pri sverkhsil'nykh razdrazheniiakh i nastroechnyi refleks 'nado').** P. O. Makarov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 144-149. 6 refs. In Russian.

Consideration of the biophysical nature of memory as the ability of the nervous system to perceive, store and reproduce information on stimuli received from internal and external media. Lasting electrosensibility phase modulations and electrosensibility variations caused by a supraintensive light stimulus in the human eye are analyzed. It is shown that a 0.9-microsec supraintensive light pulse on the order of billions of optical rheobases produces a persisting undulating imprint in memory in the form of excitability shifts. Similarity is also noted between the memory adjustment reflex called necessary and Pavlov's purpose reflex. V.Z.

A71-22485 # **Procedure for studying the critical discreteness interval of the human olfactory analysor (Metodika issledovaniia kriticheskogo intervala diskretnosti oboniatel'nogo analizatora cheloveka).** P. O. Makarov and K. Tiknevichus (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 154-156. In Russian.

Description of a laboratory assembly facilitating the discrete delivery of successive olfactory stimuli in a study of the sensibility of the olfactory analysor of man. The key feature in this assembly is a circuit designed to activate valve-controlled ducts through which mixtures of odoriferous agents and air of set compositions are delivered in alternation with air from a mixing chamber into the nose of a subject at desirable microintervals. V.Z.

A71-22486 # **Effect of ultrasound on the nerve excitation process (Vliianie ul'trazvuka na protsess vozbuzhdeniia nerva).** A. V. Lonskii and I. M. Kalashnikova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 157-162. 12 refs. In Russian.

The effect of continuous ultrasound on the isolated sciatic nerve of Rana temporaria was investigated in a Ringer solution in the absence of appreciable heating. Lower action potential amplitudes, a lower excitation threshold and a higher per-fiber spike conductivity were observed after exposures in a regular Ringer solution. The excitation threshold remained unchanged after exposures in a degassed Ringer solution. V.Z.

A71-22487 # **Type of the dependence of the absolute light threshold on the stimulus gradient (O forme zavisimosti absoliutnogo svetovogo poroga ot gradienta stimula).** T. M. Krol' (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 163-168. 5 refs. In Russian.

The dependence of the absolute light perception threshold of a darkness-adapted human eye on the light stimulus gradient was investigated on a Nagel adaptometer with increasing light pulses in a group of 26 healthy subjects performing routine adaptometer assignments. The Student-Fisher method of variational statistics was applied to calculate the median, the square deviation, the mean error, and the reliability of the collected data. The perception threshold was lower for stimuli increasing at rates from 4 to 12% per sec than for stimuli increasing at both higher and lower rates. An empirical formula is given to support the experimental curves describing this dependence. V.Z.

A71-22488 # **Role of a microinterval interaction of nervous processes in the accommodation of the eye (Rol' mikrointerval'nogo vzaimodeistviia nervnykh protsessov v akkomodatsii glaz).** E. P. Shaitor (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 169-171. 12 refs. In Russian.

The author's previous data (1964, 1966) concerning the possible role of microinterval nerve interactions in the mechanism of visual accommodation are discussed as a basis for the accommodation process. According to this hypothetical concept the visual system does not use information on the distance of the object for accommodation but relies on image distortions due to aberration and astigmatism to determine the magnitude and the sign of accommodation. Microinterval interactions in the retina reflecting pupil contractions and changes in the crystalline lens curvature are considered as factors in the accommodation mechanism. V.Z.

A71-22489 # **Application of analog computers in electroencephalogram analysis (Primenenie analogovykh vychislitel'nykh mashin dlia analiza elektroentsefalogrammy).** V. A. Doroshenko (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 10, 1969, p. 192-196. 10 refs. In Russian.

Description of several circuits using analog computers for encephalogram analysis applications. Biopotential frequency and amplitude component separation and the identification of the difference between increasing and decreasing biopotential oscillation fronts are mentioned as examples of the many physiological parameters which can be measured by EEG data processing on analog computers. V.Z.

A71-22533 # **Adrenergic neurons in the composition of intramural cardiac ganglia in mammals (Adrenergicheskie neirony v sostave intramural'nykh uzlov serdtsa u mlekopitaiushchikh zhivotnykh).** E. M. Krokhina and E. K. Plechkova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 196, Jan. 1, 1971, p. 211-213. 22 refs. In Russian.

Results of a histochemical study by means of luminescent microscopy of intramural nerve ganglia in the auricles and cardiac septum of rabbits. The presence of neurons with a typical noradrenergic luminescence was detected in this study. It is concluded that intramural cardiac ganglia of mammals include in their composition not only parasympathetic neurons but also sympathetic neurons. A.B.K.

A71-22534 # **Pyridinenucleotides of the cerebral hemispheres in rats under the action of hyperoxia (Piridinnukleotidy bol'shikh polusharii mozga krys pri vozdeistvii giperoksii).** T. N. Ivanova and L. N. Rubel' (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 196, Jan. 1, 1971, p. 240-242. 11 refs. In Russian.

Quantitative calculation of the concentration of all four forms of pyridinenucleotides (NAD, NAD-N, NADF, and NADF-N) in the brain tissue of rats subjected to various periods of exposure to hyperoxia at 1 and 7 atm abs. A considerable (20%) increase in the quantity of the oxidized form NAD, with a corresponding decrease in the reduced form NAD-N is established in cerebral hemisphere tissue exposed to 30 min of hyperoxia at 1 atm abs or 5 to 37 min at 7 atm abs. The NAD/NAD-N ratio increases from 5.6 to 8.9. However, in none of the experiments were appreciable quantities of oxidized NADF noted under conditions of hyperoxia, although the quantity of NADF-N under these conditions was reduced. A.B.K.

A71-22563 **Effect of space-flight factors on crepis-capillaris seeds.** L. G. Dubinina and O. P. Chernikova. (*Kosmicheskie Issledovaniia,* vol. 8, Jan.-Feb. 1970, p. 156-158.) *Cosmic Research,* vol. 8, Jan.-Feb. 1970, p. 146-148. 18 refs. Translation.

Investigation of the effects of spaceflight factors on dry crepis capillaris seeds placed for five days in an orbit with a 300-km apogee. Analysis of the recovered samples shows a small but statistically significant increase in the number of chromosome rearrangements. Seeds which were additionally subjected to the effects of ethylenimine after the spaceflight showed an increased mutagenic sensitivity. The mutation spectrum was shifted toward a higher number of chromosome-type mutations. T.M.

A71-22564 **Effect of space flight factors on barley seeds.** K. P. Garina and N. I. Romanova. (*Kosmicheskie Issledovaniia,* vol. 8, Jan.-Feb. 1970, p. 158, 159.) *Cosmic Research,* vol. 8, Jan.-Feb. 1970, p. 149-151. 5 refs. Translation.

Experimental study of the influence of spaceflight factors on dry barley seeds placed for five days in an orbit with an apogee of 300 km. The seeds were subsequently recovered and grown in tap water along with control seeds. Analysis of the plants provides statistical confirmation that spaceflight factors increase the number of intracellular rearrangements. No predominance of chromosome rearrangements was noted. T.M.

A71-22589 **The Austin Flint murmur and the a wave of the apexcardiogram in aortic regurgitation.** Elizabeth Parker, Ernest Craige, and W. P. Hood, Jr. (North Carolina, University, Chapel Hill, N.C.). *Circulation,* vol. 43, Mar. 1971, p. 349-359. 20 refs. PHS Grant No. HE-05486.

Hemodynamic data from 45 patients with either aortic regurgitation (with and without the Austin Flint murmur) or aortic regurgitation and mitral stenosis were correlated with the a-wave percentage amplitude of the apexcardiogram. Changes in the a wave correlated well with corresponding changes in left heart pressures but not with variations in volume. The Flint murmur showed a significant correlation with left ventricular volume changes. It is pointed out that two ancillary findings in aortic regurgitation, a high a wave in the apexcardiogram and the Austin Flint murmur, are of value in anticipating alterations in left ventricular hemodynamics as determined by left-sided catheterization and volume studies. M.M.

A71-22590 **Slopes of the carotid pulse wave in normal subjects, aortic valvular diseases, and hypertrophic subaortic stenosis.** Douglas P. Lyle, William H. Bancroft, Jr., Marjorie Tucker, and E. E. Eddleman, Jr. (U.S. Veterans Administration Hospital; Alabama, University, Birmingham, Ala.). *Circulation,* vol. 43, Mar. 1971, p. 374-381. 9 refs. PHS Grant No. HE-11310.

Examination of variations in certain slopes of the carotid pulse which exist among normal subjects, patients with aortic valvular disease, and those with hypertrophic subaortic stenosis. Records from 256 subjects were quantified with computer technics. The externally recorded volume pulses were related to simultaneously recorded brachial artery pressures (cuff); thus the slopes are expressed in mm Hg/sec. Several slopes were studied: the maximum rate of pressure rise, the mean systolic upstroke (onset of carotid upstroke to peak systolic excursion), and the least square fits of the first two-thirds of the upstroke and the first two-thirds of diastole. The least square slopes of 98% of the patients with aortic stenosis were less than 457 mm Hg/sec, whereas none of those with hypertrophic subaortic stenosis was that low. The greatest overlap was between patients with aortic stenosis and those with aortic stenosis and aortic insufficiency. M.M.

A71-22591 **Relationship between cardiac output and peripheral resistance in borderline hypertension.** Stevo Julius, Arturo V. Pascual, Rune Sannerstedt, and Charles Mitchell (Michigan, University, Ann Arbor, Mich.). *Circulation,* vol. 43, Mar. 1971, p. 382-390. 15 refs. Research supported by the American Heart Association; NIH Grants No. CD-0081-05; No. 2MO 1 RR 4209.

Eighty-eight observations on 77 patients with borderline hypertension and 82 single observations in healthy control subjects are reported. Hemodynamic effects of assumption of the sitting position, mild exercise, infusion of dextran, blockade with propranolol and with a combination of propranolol and atropine are evaluated. In the recumbent position, patients with borderline hypertension have increased cardiac output and 'normal' peripheral resistance. Under all other experimental conditions, the peripheral resistance in patients with borderline hypertension was elevated. Increased resistance was accompanied by a decrease of the cardiac output. After administration of the atropine and propranolol combination, cardiac output in patients with borderline hypertension was significantly below the normal. Nevertheless, whether cardiac output was high or low and resistance normal or elevated, patients with borderline hypertension maintained mild elevations of the blood pressure. Consequently, borderline hypertension is not caused solely by elevations of cardiac output. (Author)

A71-22609 # **Cytophotometric analysis of the proliferative activity and ploidy of fibroblasts in human vessel walls (Tsitofotometrichnii analiz proliferativnoi aktivnosti i ploidnosti fibroblastiv sudinnoi stinki liudini).** V. I. Maliuk (Akademiia Nauk Ukrains'koi RSR, Institut Zoologii, Kiev, Ukrainian SSR). *Akademiia Nauk Ukrainskoi RSR, Dopovidi, Seriia B - Geologiia, Geofizika, Khimiia i Biologiia,* vol. 33, Jan. 1971, p. 64-66. 5 refs. In Ukrainian.

Discussion of the results of a cytophotometric study of DNA in 130 Feulgen-strained fibroblast nuclei from intercostal arteries of adult subjects. The proportions of various types of cells in the fibroblasts are found to be 84% diploid cells, 8% hypoploid cells, 6% hybrid di-tetraploid cells, 1.6% pure tetraploid cells and 0.4% hypertegraploid cells. The DNA content in the fibroblast nuclei did not exceed 5 ploidy units per nucleus, an observation indicating a pronounced but relatively low proliferative activity in the adventitia of intact vessels. It is also observed that most fibroblast cells undergo division when entering the synthetic phase and that polyploid forms account for an insignificant fraction of the cell population of fibroblast nuclei. V.Z.

A71-22613 * **Human factors applications in teleoperator design and operation.** E. G. Johnsen (AEC-NASA, Space Nuclear Propulsion Office, Washington, D.C.) and W. R. Corliss. New York, Wiley-Interscience, 1971. 262 p. 579 refs. $12.95.

The book represents the first comprehensive description of a

newly recognized class of machines teleoperators. A historical sketch of teleoperators is presented. Teleoperator applications in hostile environments, nuclear industry, terrestrial transportation, public service, and as artificial limbs are discussed. Subsystems and their integration are considered. Teleoperator design principles are outlined giving attention to application-specific design philosophies. Details of the control subsystem are examined taking into account also the man-machine interface and approaches for bridging the interface. The sensor subsystem is described including the use of remote television, acoustic sensors, touch sensor, and displays. Actuator design principles are investigated, and various aspects of the actuator subsystem are explored. A forecast of future developments in this rapidly expanding field of teleoperators is given. A comprehensive bibliography and an index are provided. G.R.

A71-22640 # **Direction of the endolymph shift in the semicircular canals of a human subject undergoing rotation with head bendings in the sagittal plane (Napravlenie sdviga endolimfy v polukruzhnykh kanalakh pri vrashchenii cheloveka s naklonami golovy v sagittal'noi ploskosti).** F. A. Solodovnik. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1971, p. 60-68. 12 refs. In Russian.

Coriolis force effects on the endolymph are investigated in terms of the endolymph shift direction in the semicircular canals. Rotation of a human subject combined with head movements in the sagittal plane is found to lead to the appearance of nystagmus and illusory sensations. The direction of the inertial shift of the endolymph in each of the semicircular canals is determined on the basis of studies of the coriolis inertia force direction and semicircular canal kinematics. The results obtained are of interest for investigations of vestibular stability, vestibular training programs, and for clinical practice. M.V.E.

A71-22641 # **Effects of pure oxygen on the organism of animals at ordinary atmospheric pressure (Vliianie chistogo kisloroda pri obychnom atmosfernom davlenii na organizm zhivotnykh).** A. M. Genin, F. V. Babchinskii, and E. F. Kotovskii. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1971, p. 69-73. 22 refs. In Russian.

Investigations performed on mice and rats kept in an atmosphere of 94-98% oxygen at normal atmospheric pressure showed during the first several hours a stimulation of the vital activity obviously due to an intensification of the metabolic processes. After 6 to 12 hours of exposure to oxygen, signs of pathological changes in the lungs and other organs became noticeable. These changes consisted mostly of perivascular edema and diapedesis hemorrhages. After 24 hours, pathological disorders increased substantially, but the respiratory function continued at a still adequate level of performance. During the following 2 to 3 days, an insufficiency of external breathing developed. Cell structures were destroyed and metabolic processes became impeded. The animals kept in the oxygen atmosphere perished showing symptoms of oxygen insufficiency. M.V.E.

A71-22648 # **Hour-glass behavior of the circadian clock controlling eclosion of the silkmoth Antheraea pernyi.** James W. Truman (Harvard University, Cambridge, Mass.). *National Academy of Sciences, Proceedings,* vol. 68, Mar. 1971, p. 595-599. 9 refs. NSF Grants No. GB-7966; No. GB-7963.

Experimental investigation of the response of the brain-centered clock of the Chinese oak silkmoth Antheraea pernyi to photoperiod conditions. During each daily cycle, the onset of darkness initiates a free-running cycle of the clock. The next 'lights-on' interrupts this cycle and the clock comes to a stop late in the photophase. The moment when the Pernyi clock stops signals the release of an eclosion-stimulating hormone and is demonstrated to be a function of the time when the free-running cycle is interrupted by lights-on. Moreover, the width (duration) of the eclosion peak in a photoperiod is shown to be dependent on the length of the dark phase, and, consequently, on the amount of the free-running cycle that is completed. M.M.

A71-22649 * # **Effects of L-dopa on norepinephrine metabolism in the brain.** J. P. Chalmers, R. J. Baldessarini (MIT, Cambridge, Mass.), and R. J. Wurtman (Massachusetts General Hospital, Boston, Mass.). *National Academy of Sciences, Proceedings,* vol. 68, Mar. 1971, p. 662-666. 32 refs. NIH Grants No. MH-1667402; No. AM-14228; Grant No. NGR-22-009-272.

Experimental investigation in which rats that received L-dopa were found to have markedly lower brain concentrations of S-adenosylmethionine and of O-methylated metabolites of (3H)norepinephrine than controls. A 15 to 40% increase in brain norepinephrine content and accelerated turnover of brain norepinephrine were also observed in the animals receiving L-dopa. These changes were all transient, lasting about 1 hr and coinciding with the period when appreciable amounts of L-dopa were detectable in the brain. M.M.

A71-22681 **Effect of opticokinetic and vestibular disturbances on the reliability of a human operator in aircraft control systems.** Iu. I. Kirilenko, V. K. Filosofov, and V. S. Fomin. (*Kosmicheskie Issledovaniia,* vol. 8, May-June 1970, p. 476-478.) *Cosmic Research,* vol. 8, May-June 1970, p. 442-445. 6 refs. Translation.

Laboratory investigation of the influence of prolonged threshold and above threshold excitations of the vestibular and visual analysors on the performance characteristics of a human operator as a link of an aircraft control system. Programmed angular positive and negative acceleration was used for excitation of the vestibular analysor. The optokinetic analysor was excited by means of light streaks moving across a screen at a speed of 160 streaks per minute. The obtained correlation coefficients and operator response times are tabulated. The reliability loss and restoration laws derived are found to be in excellent agreement with the physiological indices obtained from the same tests. V.P.

A71-22809 * # **Probable solar flare doses encountered on an interplanetary mission as calculated by the MCFLARE code.** Gerald P. Lahti and Irving M. Karp (NASA, Lewis Research Center, Cleveland, Ohio). *U.S. Atomic Energy Commission and NASA, National Symposium on Natural and Manmade Radiation in Space, Las Vegas, Nev., Mar. 1-5, 1971, Paper.* 11 p. 5 refs.

The computer program, MCFLARE, uses Monte Carlo methods to simulate solar flare occurrences during an interplanetary space voyage. The total biological dose inside a shielded crew compartment due to the flares encountered during the voyage is determined. The computer program evaluates the doses obtained on a large number of trips having identical trajectories. From these results, a dose having a probability of not being exceeded during the voyage can be determined as a function of this probability for any shield material configuration. The user of the code selects any number of solar flares considered to be representative of the ones that will occur during future solar active periods. The flares are assumed to occur during these periods. The dose at a distance of 1 AU from the sun from each of these flares behind any shield configuration investigated is input to the MCFLARE code. The code accounts for the dependence of the dose received from a flare on the distance from the sun. M.M.

A71-22919 # **Study of the displacement of blood serum proteins in rats subjected to the action of accelerations (Badania przemieszczania się białek osocza krwi u szczurów poddanych działaniu przyspieszeń).** Stanisław Barański and Mieczysław Wojtkowiak. *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 5-13. In

Polish.

Wistar rats, injected with albumin containing I-131, were subjected to +5 G acceleration in the z body axis. Four groups of experimental animals were centrifuged for 15 min, and 1, 2, and 3 hr, respectively. It is shown that the gravitational force caused a displacement of the albumin in the direction of this force. It is suggested that the displacements observed are dependent upon the transfer of proteins from blood vessels. Z.W.

A71-22920 # **Tolerance of the organism to the action of accelerations and training on special gymnastic equipment (Tolerancja ustroju na działanie przyspieszeń a trening na gimnastycznych przyrządach specjalnych).** Piotr Stechni and Jan Kikowicz. *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 15-23. 10 refs. In Polish.

Study of the possibility of improving the acceleration tolerance of human subjects by means of special training. A group of subjects exhibiting low tolerance to accelerations was selected for the study. The training was carried out in two stages: (1) general gymnastics, games, and athletics, and (2) special training used in the training of aviation pilots. It was found that in 70 per cent of cases, the acceleration tolerance in human subjects could be improved by the training described. Z.W.

A71-22921 # **Effect of acute poisoning by hydrazine hydrate on the morphological pattern and changes in the blood of guinea pigs (Wpływ ostrego zatrucia wodzianem hydrazyny na obraz morfologiczny i zmiany we krwi świnek morskich).** Krzysztof Kwarecki, Jacek Różyński, Zbigniew Sarol, and Władysław Święcicki. *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 25-38. 26 refs. In Polish.

Study of the effect of hydrazine hydrate poisoning on the changes occurring in the internal organs and blood of male adult guinea pigs. The changes were studied 24, 48, and 72 hr after injecting a dose of 50 mg/kg. Samples were taken from the brain, cardiac muscle, liver, adrenal glands, and kidneys. The blood analysis was made for glucose, glutathione, lipids, cholesterol, and the total protein content. The most pronounced changes were detected in the liver and kidneys. The biological changes in the blood were found to be most significant 24 hr after poisoning. Z.W.

A71-22922 # **Certain physiological reactions of the organism during work in a hot environment (Niektóre fizjologiczne reakcje ustroju na pracę w gorącu).** Lucjan Golec, Eugeniusz Sokołowski, and Jerzy Sołtysiak. *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 39-49. 14 refs. In Polish.

Study of the effect of oxygen deficiency on the work performance of human subjects in a hot environment (40 C) with relative humidity ranging from 70 to 85 per cent. Fourteen subjects, about 19 years of age, were subjected to exercise in this environment for 25 min. It was found that only five subjects could finish the exercise. The other subjects discontinued it as a result of exhaustion or a pulse rate exceeding 180/min. In some subjects, the rectal temperature was found to rise up to 39 C. It is suggested that the rapid exhaustion was caused not by oxygen deficiency but by the increase in body temperature. Z.W.

A71-22923 # **Cultivation of unicellular green algae for ecologically closed systems (Hodowla jednokomórkowych zielenic dla układów ekologicznie zamkniętych).** Józef Skrzypczyk and Tadeusz Wilczok (Śląska Akademia Medyczna, Katowice, Poland). *Postepy Astronautyki,* vol. 4, no. 4, 1970, p. 51-59. 22 refs. In Polish.

Study of the cultivation of unicellular algae of the Chlorella and Scenedesmus types, using a mineral culture medium with microelement additions in an ecologically closed system. An optimum composition of the culture medium providing the maximum output of green mass was developed. The initial mass of the culture could be increased by a factor of 40 without changing the culture medium. Z.W.

A71-22924 # **Certain problems concerning the effect of hyperthermia on the human organism (Niektóre zagadnienia wpływu przegrzania na ustrój ludzki).** Zbigniew Edelwejn. *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 61-66. In Polish.

Study of the effect of hyperthermia on the behavior of the human neuromuscular system. It was experimentally demonstrated that the conduction velocity in nerve fibers substantially increases with increasing temperature. The mechanism of the effect of hyperthermia on the peripheral motor neuron and on the muscle governed by it is discussed. Z.W.

A71-22925 # **Ionizing radiation and the synthesis of ribonucleic acid in neurons (Synteza kwasu rybonukleinowego w neuronach a promieniowanie jonizujące).** Zbigniew Olkowski (Śląska Akademia Medyczna, Katowice, Poland). *Postępy Astronautyki,* vol. 4, no. 4, 1970, p. 67-71. In Polish.

Study of the synthesis of ribonucleic acid (RNA) in the motor neurons of the spinal cord in mice during acute radiation sickness, using the autoradiographic method. The behavior of several enzymes was also studied. It is shown that ionizing radiation inhibits RNA synthesis both in the cell nucleus and cytoplasm. The activity of enzymes is also inhibited. Z.W.

A71-22971 An approach to the dynamic analysis and synthesis of biped locomotion machines. Andrew A. Frank (Wisconsin, University, Madison, Wis.). *Medical and Biological Engineering,* vol. 8, Sept. 1970, p. 465-476. 13 refs. Research supported by the Educational Exchange Commission of Yugoslavia; NSF Grant No. GK-5897; Grant No. AF AFOSR 1018-678.

A method for the design of a dynamic biped machine is presented. Initially a minimum energy criteria is assumed. The design of a machine which satisfies this criteria follows. A conflict between this minimum energy design and stability is shown. The design of a more stable dynamic biped machine is then discussed. A set of control laws necessary for the biped's locomotion is derived. This machine is then simulated on a digital computer. The results demonstrate that the method can be effectively used for the design of prosthetic-orthodic equipment and for the analysis of human locomotion. (Author)

A71-22972 One of the problems in the measurement of blood pressure by catheter-insertion - Wave reflection at the tip of the catheter. Hiroshi Kanai, Masahiko Iizuka, and Katsuyuki Sakamoto (Pennsylvania, University, Philadelphia, Pa.; Sophia University, Tokyo, Japan). *Medical and Biological Engineering,* vol. 8, Sept. 1970, p. 483-496. PHS Grant No. HE-07762; Contract No. Nonr-551(54).

The most reliable method for the measurement of blood pressure is the use of catheter-type pressure gauges, despite its considerable errors associated with them. Many workers have discussed the errors of this method. No one, however, has discussed the effect due to the reflection of the pressure wave at the tip of the catheter and at the occluding point of the artery and the increase of the pressure wave attenuation produced by the insertion of the catheter into blood vessels. In this paper, the problem is discussed both theoretically and experimentally. The error due to the wave reflection is sometimes very large. To reduce this error, the diameter of the catheter must be quite small. However, if the diameter of catheter is too small, the error due to distortion of the wave during its propagation in the catheter becomes quite large. Therefore, a catheter of appropriate diameter must be used for each experiment.

For example, if a catheter of 2 mm in diameter is used for an experiment on a large dog in a controlled state, the error is expected to be less than 5 per cent. (Author)

A71-22983 * Amino-acids, aliphatic and aromatic hydrocarbons in the Murchison meteorite. J. Oró, J. Gibert, H. Lichtenstein, S. Wikstrom, and D. A. Flory (Houston, University, Houston, Tex.). *Nature*, vol. 230, Mar. 12, 1971, p. 105, 106. 20 refs. NASA-supported research.

Analysis of a specimen of the Murchison meteorite, a type III carbonaceous chondrite, showing it to contain substantial amounts of extractable organic compounds giving distribution patterns significantly different from and much more complex than those observed previously. Evidence is obtained for the chemical formation of amino acids in one or several of a number of ways, although the most likely mode of synthesis is thought to be extraterrestrial abiotic synthesis before, during, or after the formation of the meteorite parent body. The aliphatic hydrocarbons observed range from C sub 10 to relatively high-molecular-weight components. The most abundant series corresponds to the branched saturated alkanes. They include predominantly monomethylated and dimethylated isomers. A.B.K.

A71-22973 A television device to provoke optokinetic nystagmus. I. C. Daskalov and R. D. Aleksiev (Ministerstvo na Narodnoto Zdrave, Sofia, Bulgaria). *Medical and Biological Engineering*, vol. 8, Sept. 1970, p. 529, 530.

Development of a combination of a television set and a television bar generator with controllable frame desynchronizing to provide the necessary moving image and all the facilities securing the electrical control of the stimulus parameters. An important feature of the device is the very convincing television image in comparison with the Bárány rotating drum. F.R.L.

A71-22984 * Configuration of amino-acids in carbonaceous chondrites and a Pre-Cambrian chert. J. Oró, S. Nakaparksin, H. Lichtenstein, and E. Gil-Av (Houston, University, Houston, Tex.). *Nature*, vol. 230, Mar. 12, 1971, p. 107, 108. 21 refs. NASA-supported research.

Application of a previously described method for the analysis of protein amino acids to meteorites (Orgueil, Mokoia, and Murray) and a Precambrian sediment (Fig Tree chert). The results obtained suggest multiple sources for the amino acids in carbonaceous chondrites. The data on Orgueil and Mokoia show that the bound amino acids in these meteorites are almost exclusively of the L configuration with the exception of D-alanine. It is suggested that the bulk of the bound amino acids are the result of terrestrial contamination by microorganisms. In the case of Murray a greater quantity of D-amino acids is noted, indicating considerable contamination. On the basis of a comparison of Murray with a soil sample it is concluded that a small percentage of the amino acids of Murray are racemic mixtures of possible abiotic origin. Convincing evidence is obtained that the amino acids in the Fig Tree chert are almost exclusively of the L configuration, thus arguing for recent terrestrial contamination of the samples, as in the case of the Orgueil and Mokoia meteorites. In the case of Murray about 90 percent of the amino acids is believed to result from biological contamination, while the remaining acids (both D and L configurations) are of probable chemical origin. A.B.K.

A71-22985 Acellular corneal transparency. Albert L. Rubin, Mary Jo Powers, Lynn E. Hopkins, Kurt H. Stenzel (Cornell University, New York, N.Y.), Michael W. Dunn (Roosevelt Hospital, New York, N.Y.), and Teruo Miyata (Japan Leather Co., Tokyo, Japan). *Nature*, vol. 230, Mar. 12, 1971, p. 120, 121. Research supported by the John A. Hartford Foundation and PHS.

Description of a method of maintaining corneal transparency in the absence of metabolic activity. It is shown that corneal transparency can be maintained in the case of animal corneas by depleting the cornea of ground substance and irradiating the stroma to stabilize the basic collagen framework. It is concluded that maintenance of corneal transparency depends on both acid mucopolysaccharide depletion and prolonged gamma irradiation. A.B.K.

A71-23011 The e-wave and inhibition in the developing retina of the frog. Frederick Crescitelli (California, University, Los Angeles, Calif.). *Vision Research*, vol. 10, Nov. 1970, p. 1077-1091. 15 refs.

Description of a delayed electrical response to light elicited by the eye of the tadpole of Rana pipiens. In its properties this response resembles the e-wave previously recorded from the isolated retina of the adult frog. The results are interpreted in terms of the action of a long-lasting inhibition, greater at higher intensities, which persists after the end of the stimulus. The late appearance of the response may be due to inhibitory interaction via interreceptor connections which have been seen to occur in the retina of this frog. M.M.

A71-23012 The W-potential - A special summated evoked potential (Das W-Potential - Ein besonderes evoziertes Summenpotential). Helmut Emrich (Max-Planck-Institut für Hirnforschung, Göttingen, West Germany). *Vision Research*, vol. 10, Nov. 1970, p. 1155-1157. 5 refs. In German.

Investigation of 50 healthy subjects, six of whom were found to have an evoked potential, which was very simply w-formed. It changed in the same manner as other evoked potentials from changes in the experimental conditions. Almost every response to a light-stimulus in w-potential shows the same shape of curve as the final summated evoked potential. In other evoked potentials there are no such findings. Therefore the mean deviation in w-potentials is much smaller than those in other potentials. This fact is significant according to the Wilcoxon test. M.M.

A71-23013 A new kind of stereoscopic vision. Colin Blakemore (Cambridge University, Cambridge, England). *Vision Research*, vol. 10, Nov. 1970, p. 1181-1199. 25 refs. Medical Research Council Grant No. G.968/190/B.

A vertical grating of different spatial frequency in the two eyes mimics the views gained of a real grating rotated about its vertical axis. This is exactly the sensation that such a binocular stimulus produces. The impression of rotation is complete and global: the whole grating seems fused until the difference in spatial period exceeds about 30%. At low and high spatial frequencies the phenomenon does not occur. The break in fusion comes at the same ratio of periods whatever the angular width of the gratings. The sensation is not affected by movement or a slight reduction in contrast of the grating in one eye. This kind of stereopsis may be dependent on a comparison of the spatial periodicity of the patterns in the two eyes, rather than a point-by-point analysis of positional disparity. M.M.

A71-23014 Loci of perceived, equi-, half- and double-distance in stereoscopic vision. J. M. Foley (California, University, Santa Barbara, Calif.). *Vision Research*, vol. 10, Nov. 1970, p. 1201-1209. 9 refs. PHS Grant No. MH-08878.

Description of four experiments in which the loci of equi-, half-, and double-distance were determined under varying degrees of convergence with point sources as stimuli. Eye movement was permitted and secondary cues excluded. The locus of perceived equidistance is less curved than that of the apparent fronto-parallel plane. It may be more or less curved than the Vieth-Müller Circle (VMC) depending on the number of lights in the field. It becomes

more disparate relative to the VMC as convergence increases. Loci of perceived half- and double-distance have approximately the same form as loci of perceived equidistance. M.M.

A71-23015 Masking effects associated with the perception of double flashes (Hemmungsvorgänge bei der Wahrnehmung mehrfarbiger Doppelblitze). Hans Munker (München, Universität, Munich, West Germany). *Vision Research,* vol. 10, Nov. 1970, p. 1211-1223. 33 refs. In German.

Temporal masking effects were studied by color matching of double flashes. The double flash consisted of a colored preflash, in most cases red, and an achromatic afterflash with an interval of 12.5 to 50 msec. The color of the complete flash was green for short preflash duration and red for long preflash duration. Time parameters were varied, and curves are given for redness of the matched color plotted against preflash duration. With nonred preflash a color shift to green was often observed. The phenomenon is explained on the basis of results known from achromatic double-flash experiments. M.M.

A71-23016 The nonius horopter. I, II. T. Shipley and S. C. Rawlings (Miami, University, Miami, Fla.). *Vision Research,* vol. 10, Nov. 1970, p. 1225-1299. 170 refs. PHS Grant No. NB-06343.

Historical review of nonius horopter theory, and description of a new mathematical model. A reanalysis of previous data is made in preparation for a new series of experimental studies on this problem. Some questions are raised about the definition of binocular disparity, and the elusive concept of Hering and Hillebrand concerning the so-called horopter deviation is reformulated. The ultimate aim of horopter studies is the elucidation of the physiology of binocular correspondence. With this in mind, the most acceptable subjective criterion is that of common monocular visual directions. Thus, the true subjective horopter is more a matter of visual direction than it is of visual distance. M.M.

A71-23069 Clinical pathophysiology of respiration (Klinische Pathophysiologie der Atmung). A. A. Bühlmann (Medizinische Universitätsklinik, Zurich, Switzerland) and P. H. Rossier. Berlin, Springer-Verlag, 1970. 226 p. 327 refs. In German. $18.70.

Physiology of respiration under normal conditions is first discussed in terms of the mechanisms of breathing, pulmonary gas exchange, gas transportation in blood, respiratory control, and influence of age on human respiratory capacity. In dealing with general respiratory pathophysiology, effects of abnormal atmospheric conditions and various pathophysiological syndromes are examined. Particular emphasis is placed on special respiratory pathophysiology; diseases of the thorax, pleura, and the lungs, and also heart and arterial diseases are discussed in detail. Breathing during extrathoracic diseases is also considered. Finally, respiration in emergency situations and problems associated with pulmonary surgery are dealt with. O.H.

A71-23071 Jet aircraft and problems of hygiene (Düsenflugzeuge und Hygiene-Probleme). Roswitha Schmid. *Naturwissenschaftliche Rundschau,* vol. 24, Mar. 1971, p. 115-118. In German.

It is pointed out that in the age of the international jet traffic the potential danger exists that diseases from one country can easily be introduced into another country located in another part of the world. However, the actual spread of communicable disease by means of air traffic did not occur due to the preventive measures taken by the airlines. High standards regarding the purity of water and food provided by the airlines are a major factor in this situation. Approaches of various airlines regarding preparation and storage of food are discussed. Problems in connection with providing food and water in foreign countries especially in those with low health standards and insufficient sanitary supervision are discussed. Toilets represent another crucial area which requires careful handling. Measures taken with regard to health supervision concerning a number of contagious diseases are considered. G.R.

A71-23149 *Genetic research in space.* Ia. L. Glembotskii. (*Kosmicheskie Issledovaniia,* vol. 8, July-Aug. 1970, p. 616-627.) *Cosmic Research,* vol. 8, July-Aug. 1970, p. 567-575. 17 refs. Translation.

Review of the results of studies of genetic effects of space travel performed in the USSR and U.S. over the period from 1961 to 1968. These studies were aimed at detecting the effects of space travel sources of influence - such as radiation, weightlessness, vibrations, and acceleration - on the heredity of three insect species - namely, the Drosophila fruit fly, the Tribolium confusam flour beetle, and the Habrobracon wasp - representing classical objects for genetic experiments. The reported findings include some evidence of a reinforcing action of weightlessness upon the effects of radiation. Yet, it is felt that this does not rule out the possibility that weightlessness alone may affect the structure of heredity-conditioning cells in the course of prolonged space travel. This possibility is shown to be supported by the increased incidence of translocations observed in the spermatogoniae of Drosophila fruit flies exposed to the effects of space travel in the gamma-radiation-proof compartment of Biosputnik 2. M.V.E.

A71-23160 Photosensitivity of the circadian rhythm and of visual receptors in carotenoid-depleted drosophila. William F. Zimmerman (Amherst College, Amherst, Mass.) and Timothy H. Goldsmith (Yale University, New Haven, Conn.). *Science,* vol. 171, Mar. 19, 1971, p. 1167-1169. 20 refs. NSF Grant No. GB-8303; PHS Grant No. EY-00222.

Results of raising Drosophila melanogaster on aseptic diets, with and without beta-carotene. The sensitivity of visual receptors in the carotenoid-depleted flies was lowered 3 log units, but the photosensitivity of the circadian rhythm was not affected. This result suggests that the chromophore of the photopigment which mediates light effects on the circadian rhythm is not a carotenoid derivative. F.R.L.

A71-23236 *Decompression sickness - Advances and interpretations.* Albert R. Behnke. *Aerospace Medicine,* vol. 42, Mar. 1971, p. 255-267. 54 refs.

Discussion of the advances achieved so far in the study of decompression sickness - i.e., derangements during the course of and following decompression from pressurized atmospheres. A synoptic review of decompression sickness is presented and several multiple factors and complications in the sickness are examined. The problems of safe decompression are discussed in detail. The review culminates in three challenging demands: (1) quantification of gas transport during decompression, (2) measurements of inert gas elimination and metabolic gas exchange during recompression therapy, (3) and elucidation of physical and physiologic mechanisms underlying bubble absorption during recompression. These investigations would be complementary to in vivo measurement of total body water and fat, as well as to the employment of sophisticated techniques for assessment of work performance in normal and aqueous environments. O.H.

A71-23237 Effect of Furosemide (Lasix) on physical work capacity of altitude-acclimatised subjects at an altitude of 11,000 feet. C. S. Nair and P. M. Gopinath (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aerospace Medicine,* vol. 42, Mar. 1971, p. 268-270. 20 refs.

Furosemide (Lasix) was administered to human subjects who

had undergone acclimatization to altitude for a period of three weeks. Recovery pulse response after standard exercise tolerance test, exercise ventilation, percentage of oxygen extraction and oxygen uptake during exercise, were determined before and after the administration of the drug. Results indicate no change in recovery pulse response and exercise ventilation. There was a significant rise in the percentage of oxygen extraction and a highly significant increase in the oxygen uptake during exercise. Furosemide decreased oxygen debt and improved physical work capacity. (Author)

A71-23238 * Introduction - Biosatellite III results. W. R. Adey and P. M. Hahn (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 273-280. 7 refs. Contract No. NAS 2-2503.

A description of the orbiting vehicle as it relates to the support of the Biosatellite III experiment and the protocol for the subject of this experiment are presented. This description is of general nature and is intended to be of assistance to the reader of the six following papers discussing the results from this flight. (Author)

A71-23239 * Analysis of 10 minutes of physiological data from the Biosatellite III from lift-off to orbital insertion. R. I. Tejada, P. M. Hahn, and W. R. Adey (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 281-287. 12 refs. NIH Grant No. FR-3; Contract No. NAS 2-2503.

Physiological responses in a Macaca nemestrina monkey are described from lift-off to orbital insertion in the NASA Biosatellite III spacecraft, based on 30 channels of biological data. These data cover a 10-min epoch and show intense EEG and EMG arousal reactions at launch and the development of motion sickness after 28 sec of powered flight. Implications of vibrational stimuli in cardiovascular and respiratory changes are discussed. 'Driving reactions' are described in parietal EEG leads during nystagmus and methods of computer analysis are reviewed. (Author)

A71-23240 * Sleep/wake activity patterns of a Macaca nemestrina monkey during nine days of weightlessness. T. Hoshizaki, R. Durham, and W. R. Adey (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 288-295. 14 refs. Contract No. NAS 2-2503.

The effect of weightlessness on the sleep/wake cycle of a Macaca nemestrina monkey was studied. A 24-hr regimen was imposed during the 9-day Biosatellite III flight. Data (time-lapse and telemetry) from one flight and nine control subjects are included. The sleep/wake cycle of the flight subject was 24 hr but a phase angle difference of 2 hr from the imposed night/day modes occurred. Rapid shifts in sleep/wake states occurred. Control subjects tested under 1 g were phase-locked to the imposed 24-hr cycle and did not exhibit rapid shifts in their sleep/wake states. In the flight subject, the findings by others of a 24-hr rhythm in blood pressure and a 26-hr rhythm in the heart rate, body and brain temperature and pCO2, and our findings of a 24-hr rhythm in the sleep/wake activity indicate that internal desynchronosis occurred. Such desynchronosis was not observed in ground control subjects. (Author)

A71-23241 * Circadian rhythms of the Macaca nemestrina monkey in Biosatellite III. P. M. Hahn, T. Hoshizaki, and W. R. Adey (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 295-304. 25 refs. NIH Grant No. FR-3; Contract No. NAS 2-2503.

Circadian rhythms of environmental and physiological parameters in the Biosatellite III orbiting vehicle and its passenger are described. The period of each parameter is analyzed. By means of this analysis, a lack of synchrony is delineated between physiological parameters, and between certain physiological and environmental parameters. (Author)

A71-23242 * Sleep and wake states in the Biosatellite III monkey - Visual and computer analysis of telemetered electroencephalographic data from earth orbital flight. J. Hanley and W. R. Adey (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 304-313. 30 refs. Contract No. NAS 2-2503.

During the 8.8 days of orbital flight the wake-sleep states of the primate were much perturbed. These perturbations are attributed to the weightless state. The normal terrestrial cycle was never attained. Sleep states were remarkably fragmented and unusually brief in duration. Pendular eye movements seen during wake and sleep indicate that a vestibular ocular disturbance persisted during altered consciousness. Eye movements during stages II and IV sleep are further evidence that the oculomotor system was not functioning in the usual manner. Changes in the EEG which accompanied cessation of eye movement around orbit 126 are discussed. Results obtained are compared with findings concerning Russian and American astronauts, and possible implications for prolonged manned space flight are examined. G.R.

A71-23243 * Digital computer analysis of neurophysiological data from Biosatellite III. D. O. Walter, J. I. Berkhout, R. Buchness, E. Kram, L. Rovner, and W. R. Adey (California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 314-321. 7 refs. PHS Grant No. FR-3; Contract No. NAS 2-2503.

Spectra and coherences are presented principally in the form of contour maps which compress much data into brief compass. Transient changes in the animal's responsive states, circadian rhythms in neuroelectric parameters, and the general course of the EEG for the entire flight are represented in one highly compressed set of maps, while the extreme and unexpected variability of EEG activity, which may be a definite correlate of weightlessness, is shown in others. The complex data analysis and presentation system used for this flight is described in the appendix. (Author)

A71-23244 * Cardiovascular observations of the Macaca nemestrina monkey in Biosatellite III. John P. Meehan and Roland D. Rader (Southern California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 322-336. 10 refs. Contract No. NAS 2-2633.

A description of the cardiovascular observations conducted on the Biosatellite III flight is presented. Comparison is made of data obtained in flight with that obtained on the ground. The flight subject experienced an immediate sustained increase in central venous pressure resulting from a central pooling of blood volume. This shift in blood volume is thought to have initiated the Henry-Gauer mechanism whereby urine volume was initially maintained at a high level. This coupled with a high evaporative fluid loss produced an early dehydration probably associated with electrolyte imbalances. Venous pressure started to fall on flight day 5, while arterial pressure and heart rate were within physiologic limits until day 8, i.e., near the termination of the flight. (Author)

A71-23245 Crew performance as a factor of information input. Richard E. McKenzie (Texas, University, San Antonio, Tex.). *Aerospace Medicine*, vol. 42, Mar. 1971, p. 337-339.

A review of the USAF School of Aerospace Medicine two-man space cabin research studies, involving thirteen 'flights,' revealed an important aspect of information input rate for evaluation. It appears quite clear that a significant enhancement of performance is related to information input requirement as a factor in crew performance. (Author)

A71-23246 Systolic prolapse of the mitral valve - Possible aeromedical significance. William D. Towne, Shahbudin H.

Rahimtoola, Kenneth M. Rosen, Rolf M. Gunnar (Cook County Hospital; Illinois, University, Chicago, Ill.), and Chris P. Casten (Cook County Hospital, Chicago, Ill.). *Aerospace Medicine,* vol. 42, Mar. 1971, p. 341-344. 18 refs.

A patient seen in civilian practice is presented. The subject was thought to have no heart disease by several qualified examiners on initial evaluation; but later, characteristic physical signs appeared and the patient was proven to have systolic prolapse of the mitral valve. It is pointed out that an increase in left ventricular afterload with a simultaneous decrease in left ventricular size such as occurs with +G acceleration could be expected to markedly increase mitral regurgitant volume in these subjects. High G loading might aggravate mitral valve prolapse or even lead to chordal rupture. Significant arrhythmias and sudden death have been reported in several affected subjects. These features make it necessary that care be exercised in discovering this disorder in aviation candidates. G.R.

A71-23247 Levels of carbon monoxide recorded on aircraft flight decks. H. J. Judd (Air Corporations Joint Medical Service, London, England). *Aerospace Medicine,* vol. 42, Mar. 1971, p. 344-348.

This paper reviews the toxicology of carbon monoxide, points out the essential meteorological conditions under which this becomes of practical importance, and demonstrates the significance of pressurization, tobacco smoking, and the results of carbon monoxide levels recorded on the flight decks of assorted jet aircraft under normal operational conditions. The object of this study was to attempt to outline any potential dangers arising from carbon monoxide on aircraft flight decks. The results obtained in the present series of tests are not conclusive but, as shown in the report, the prevailing conditions at the time were not likely to give rise to high concentrations of carbon monoxide. In addition, little is known regarding the levels of carboxyhaemoglobin in air crews prior to boarding the aircraft as a result of exposure to general atmospheric pollution and smoking of tobacco. (Author)

A71-23248 # Clinical value of the electroencephalogram following sleep deprivation. Lauren K. Welch (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) and Joseph B. Stevens (USAF, Medical Center, Lackland AFB, Tex.). *Aerospace Medicine,* vol. 42, Mar. 1971, p. 349-351. 5 refs. USAF-sponsored research.

Ninety-six patients referred to Neurology at the USAF School of Aerospace Medicine were studied with a routine resting EEG and an EEG following sleep deprivation. Seventy-eight were patients with neurological complaints other than seizure disorder. Eighteen of the ninety-six had no neurological complaints (candidates for high performance flying positions) and were used as controls. Sleep deprivation did not activate the EEGs of the healthy subjects, but twelve of the seventy-eight EEGs in the patient group showed unequivocal worsening following sleep deprivation. G.R.

A71-23249 High frequency hearing loss in an F-100 squadron - An epidemiological problem. Arnold L. Lieber (Miami, University, Miami, Fla.). *Archives of Environmental Health,* vol. 22, Apr. 1971, p. 421-427.

The occurrence of a significant number of acute hearing losses among the pilots of a US Air Force tactical fighter squadron (F-100 aircraft) was documented. Five other F-100 squadrons located within a 50 mile radius were surveyed and no problem of similar proportions was encountered elsewhere. The total environment, both ground and inflight, was investigated in an attempt to pinpoint the causes of the observed hearing damage. Two primary contributing factors were implicated: (1) an excessively noisy ground environment and (2) excessive in-flight noise exposure resulting from high ambient cockpit noise levels together with inadequate noise attenuation by the helmet-headset then in use by the squadron pilots. The composite noise exposure time accounted for the observed hearing losses among pilots of the involved squadron. (Author)

A71-23250 Carbon dioxide tolerance after adaptation to hypercarbia. Joseph M. Stinson, Howard P. Smith (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.), Atwell N. Rumsey (USAF, Central Inertial Guidance Test Facility, Holloman AFB, N. Mex.), and Jeffrey H. Smith. *Archives of Environmental Health,* vol. 22, Apr. 1971, p. 440-443. 18 refs.

Results of an experiment in which three unanesthetized rhesus monkeys, seated upright, were exposed to graded hypercarbia (30% carbon dioxide per hour) after 72 hours at 4 plus or minus 0.5% CO2 in an environmental chamber with ambient pressure (4300-ft elevation), oxygen tension, and temperature. Narcotic and lethal levels of CO2 were compared to those in three monkeys exposed to 30% CO2 per hour after 72 hours at ambient air in the same chamber. No significant difference was found between the two groups. When these data were compared to those in three monkeys from a previous study, restrained in the supine position, differences were significant for both narcosis and death, with upright animals more tolerant to CO2. These findings indicate that CO2 adaptation fails to extend tolerance to acute exposures to CO2; however, the upright position affords more protection than does the supine position. (Author)

A71-23256 • Cardiac arrhythmias simulated by concealed bundle of His extrasystoles in the dog. Anthony N. Damato, Sun H. Lau, and Gustavus Bobb (U.S. Public Health Service Hospital, Staten Island, N.Y.). *Circulation Research,* vol. 28, Mar. 1971, p. 316-322. 19 refs. NIH-supported research; NASA Contract No. T 22416.

Multiple close bipolar electrograms were obtained from various regions of both the atria and the bundle of His in ten open-chest intact dog hearts. The bundle of His was also prematurely stimulated at varying coupling intervals following a sinus beat. At short coupling intervals, the bundle of His stimulus failed to propagate antegradely (no ventricular response) but did propagate retrogradely. Coupled bundle of His stimuli retrogradely concealed within the A-V node caused the next sinus impulse to be delayed or blocked. Types I and II second degree A-V block, high degree A-V block, nonconducted atrial extrasystoles, and alternation of the P-R interval were simulated. T.M.

A71-23257 Disorder in excitation-contraction coupling of cardiac muscle from cats with experimentally produced right ventricular hypertrophy. Raimund L. Kaufmann, Hermann Hamburger, and Heike Wirth (Freiburg, Universität, Freiburg im Breisgau, West Germany). *Circulation Research,* vol. 28, Mar. 1971, p. 346-357. 45 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The contractile and electrical activity of papillary muscles from hypertrophied right ventricles of cats with artificial stenosis of the pulmonary artery was investigated. The results provide evidence that the depressed contractile state of the hypertrophied cardiac muscle is due to a disorder in excitation-contraction coupling rather than to an exhaustion of the energy supply system. It is also shown that the increase in the volume of each cellular unit is clearly related to the decrease in contractility. T.M.

A71-23258 Blood hyperosmolality and pulmonary vascular resistance in the cat. Anton Hauge and Gunnar Bø (Oslo, University, Oslo, Norway). *Circulation Research,* vol. 28, Mar. 1971, p. 371-376. 15 refs.

Study of the effect of slow graded rises of blood osmolality on pulmonary vascular resistance in cats. Hyperosmolar solutions of sodium chloride, mannitol, urea, glucose, thiourea, and ethylene glycol were infused into the left lower lobe pulmonary arterial branch. With the exception of ethylene glycol, all the test solutions caused dose-dependent, reversible reductions in lobe vascular resistance (LVR). Maximum reduction in LVR was 30% of initial

value. A 25 milliosmols per liter rise of blood osmolality (comparable with levels found during exercise) caused a 10% reduction in LVR.
T.M.

A71-23358 * Dynamic respiratory and circulatory responses to hypoxia in the anesthetized dog. D. E. Carrell and H. T. Milhorn, Jr. (Mississippi, University, Jackson, Miss.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 305-312. 21 refs. Grant No. NGR-25-002-015.

Evaluation of the dynamic response of the oxygen transport system to hypoxia in 18 mongrel dogs weighing 12 to 17 kg (average 13.9 kg) anesthetized with chloralose (60 mg/kg) and urethan (600 mg/kg). The test animals were subjected to step changes to 10, 8, and 6% oxygen for 10-min periods alternating with 10-min periods at room air control values. The following variables were recorded: arterial oxygen partial pressure, mixed venous oxygen partial pressure, external jugular oxygen partial pressure, femoral vein oxygen partial pressure, heart rate, blood pressure, aortic blood flow, carotid blood flow, femoral blood flow, respiratory rate, tidal volume, and minute ventilation. With the exception of blood gases, all variables increased in response to hypoxia at all levels. The response time of ventilation was consistently fast at all levels, while circulatory responses occurred fastest at 8% and slowest at 6% oxygen. Smallest half-times for blood flow occurred in the carotid artery while largest half-times were seen in femoral flow. Return to room air showed larger half-times for most variables. (Author)

A71-23359 # Effects of helium and nitrogen upon intraocular pressure during near-vacuum exposure. Julian P. Cooke (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 313-318. 19 refs.

Evaluation of the effects of different breathing gases upon directly measured intraocular pressure (IOP) during and after a near-vacuum exposure in anesthetized and unanesthetized dogs rapidly decompressed from 258 to 2 torr while breathing either (1) 100% O2, (2) 70% O2:30% He, or (3) 70% O2:30% N2. Comparisons were also made with N2 at ground-level pressure. The IOP increased 2 times during exposures at 2 torr with O2, 3 times with O2:He, and 3.5 times with O2:N2. Hypoxia produced by N2 breathing at ground-level pressure caused a 0.5 times IOP increase. The IOP increase at 2 torr was associated with equalization of arterial and venous pressures. This increase, together with a temperature drop, helped prevent formation of bubbles and reduced the frequency of retinal hemorrhage to zero. After recompression, IOP returned to control levels and then increased temporarily, this being associated primarily with high arterial pressure. Oxygen is slightly favored for early retinal vascular recovery and return of consciousness. (Author)

A71-23360 Arterial blood and muscle lactates during swimming in the rat. Christopher A. Dawson, Ethan R. Nadel, and Steven M. Horvath (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 322-327. 30 refs. Grant No. AF AFOSR 69-1653.

Experimental study of the pattern of arterial blood and gastrocnemius muscle lactate response to the swimming stress in the swimming rat. To evaluate the significance of the circulatory changes previously observed in the swimming rat, arterial blood samples for lactate, pyruvate, and glucose analysis, and gastrocnemius muscle samples for lactate analysis were obtained from rats swimming in 22 and 37 C water. The factors limiting swimming endurance in cold water are discussed. O.H.

A71-23361 Changes in cardiac and skeletal muscle myosin ATPase activities after exercise. James E. Wilkerson and Eugene Evonuk (Oregon, University, Eugene, Ore.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 328-330. 29 refs.

The calcium-activated adenosine triphosphatase (ATPase) activities of cardiac ventricle and gastrocnemius muscles of the rat were determined after various exercise programs. A mild exercise program in which the animals swam unweighted for 30 min every other day for 10 weeks, and two exhaustive exercise programs in which the animals swam weighted (5% additional weight) to exhaustion every other day for either 6 or 10 weeks were used. The specific activity of cardiac ventricle myosin ATPase was elevated significantly (P less than 0.01) above control levels following each of the exercise programs. The specific activity of gastrocnemius myosin ATPase was unchanged when compared to control levels following mild exercise, but was significantly elevated (P less than 0.01) following both 6- and 10-week exhaustive exercise programs (training). Additionally, these findings indicated that the arbitrary classification of exercise levels to an entire organism is not without fault because of the variation in response by different tissues to each level of exercise stress. (Author)

A71-23362 Long-term precision of the N2O method for coronary flow during heavy upright exercise. Charles R. Jorgensen, Kazuto Kitamura, Fredarick L. Gobel, Henry L. Taylor, and Yang Wang (Minnesota, University, Minneapolis, Minn.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 338-344. 33 refs. Research supported by the Minnesota Heart Association; PHS Grants No. HE-06314-10; No. HE-10296-03.

This report examines the feasibility and reproducibility of measurements of coronary blood flow by the nitrous oxide method during strenuous upright exercise in normal subjects. Modification of the conventional nitrous oxide method with regard to timing of samples and the integration of the arteriovenous nitrous oxide difference was necessary in order to measure the high coronary blood flow during exercise at heart rates of 150-170 beats/min. Eight normal subjects were studied at one to three levels of exercise on two separate occasions an average of 40 days apart. Reproducibility was measured by the quotient of the standard deviation of the differences between determinations on the two occasions within individuals, and the mean for the group on the first occasion. Systemic hemodynamic measurements were well reproduced as were the determinations of arterial and coronary sinus oxygen content. The reproducibility of measurements of coronary blood flow and myocardial oxygen consumption was of the same order of magnitude as that found by others for the measurement of cardiac output during exercise of the same intensity. (Author)

A71-23363 Dynamic relationship between isometric muscle tension and the electromyogram in man. Gerald L. Gottlieb (Rush-Presbyterian-St. Luke's Medical Center, Chicago, Ill.) and Gyan C. Agarwal (Illinois, University, Chicago, Ill.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 345-351. 27 refs. NSF Grant No. GK-17581.

Human skeletal muscle may be regarded as an electromechanical transducer. Its physiological input is a bioelectric neural signal originating in the spinal cord and its output is muscle contraction and force, these both being dependent upon the mechanical load. The paper describes some experimental data taken during various voluntary efforts of the foot. Recordings were made of the soleus and anterior tibial muscles' electromyograms and of the foot torque. By various filtering and averaging techniques, 'average' responses during step and ramp efforts of various duration are derived. Some of the above experiments are simulated by an analog model, the input of which is recorded physiological soleus muscle electrical activity. The output is simulated foot torque. The results are discussed and a model variable which may be identified with the muscle 'active state' is described. (Author)

A71-23364 Effects of smoke on tolerance of rats to hypoxia. P. D. Altland, H. F. Brubach, M. G. Parker, M. P. Dieter,

and M. Murayama (National Institutes of Health, National Institute of Arthritis and Metabolic Diseases, Bethesda, Md.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 352-357. 23 refs.

All rats survived 4-hr exposure to tobacco smoke (nicotine less than 1.8 mg/cigarette, carbon monoxide 0.045%) or corn silk smoke (no nicotine, CO 0.031%) in 20.9, and in 11.8% O2. The mortality of rats in tobacco smoke was greater than in corn silk smoke in 10.4, 8.3, and 6.6% O2. This difference was attributed to higher COHb saturations and to nicotine in the tobacco smoke. Rats exposed to 0.045% CO in 8.3% O2 without smoke had a higher survival than rats exposed to tobacco smoke in 8.3% O2 though COHb concentrations were equivalent. Both types of smoke produced an immediate reduction in breathing rate in all O2 concentrations, but 0.045% CO alone had no such effect. Hypothermia produced in rats by hypoxia was intensified only by exposure to tobacco smoke. Blood glucose and serum lactic acid values were higher in rats in tobacco than in corn silk smoke at all hypoxic levels. The critical O2 concentration which produced 'excess lactate,' an index of anaerobic metabolism, was 6.6% O2 without smoke, 8.3% O2 in corn silk smoke, and 10.4% O2 in tobacco smoke. (Author)

A71-23365 Effect of prolonged bed rest on renal diluting capacity in normal man. Murray Epstein (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 366-369. 19 refs.

The effects of 2 weeks of absolute bed rest on renal diluting capacity were studied in eight normal young male subjects. An acute sustained oral water load of 20 ml/kg was administered during a control period of normal activity, on the 13th day of absolute bed rest and on the 4th or 14th day of postbed-rest recovery. Bed rest did not significantly alter peak urine flow corrected for GFR (V/GFR), ability to generate free water (CH2O) or to achieve minimal urine osmolality. The results suggest that despite analogies with adrenal insufficiency, including both a decrease in plasma volume and a decrease in adrenocortical reserve, prolonged bed rest does not impair renal diluting capacity. (Author)

A71-23366 Effect of skin cooling on exercise ventilation in the awake dog. C. R. Bainton and R. A. Mitchell (California, University, San Francisco, Calif.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 370-377. 12 refs. PHS Grants No. 1P01-GM-15571-02; No. 5TI GM-00063-13.

During constant exercise, as the skin is cooled, panting ceases at a skin temperature of 35 to 25 C varying with the dog and core temperature. Shivering begins 5 to 13 C lower. In the absence of panting, slope and position of the carbon dioxide response curve are unaffected by skin and core temperature although shivering increases ventilation and arterial carbon dioxide partial pressure along the carbon dioxide response curve. It is concluded that below the panting threshold exercise hyperpnea and the carbon dioxide response curve are independent of skin and core temperature and unaffected by shivering. G.R.

A71-23367 Comparison of cardiovascular responses to steady- and unsteady-state exercise. Robert Gilbert and J. H. Auchincloss, Jr. (New York, State University, Syracuse, N.Y.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 388-393. 11 refs. PHS Grant No. H-2800.

The interrelationships among cardiac output, heart rate, and oxygen uptake were compared during steady- and unsteady-state treadmill exercise. Two types of unsteady-state protocols were used: (1) step function with fixed speed and grade and (2) ramp function where speed was constant while grade increased continuously. There were 73 sets of exercise observations in six normal subjects. Cardiac output was estimated either by the indicator-dilution technique or a single-breath method. There was no difference in the relationship of cardiac output to oxygen uptake among any of the exercise protocols. For heart rate vs oxygen uptake, there was a trend toward higher heart rates for a given oxygen uptake during the unsteady-state protocols compared to the steady state. The variability of heart rate vs oxygen uptake was much greater than that for cardiac output vs oxygen uptake. These results indicate that heart rate and stroke volume are adjusted during unsteady states of exercise so that the relationship between cardiac output and oxygen uptake is similar to that of the steady state. (Author)

A71-23368 Cost of submaximal and maximal work during chronic exposure at 3,800 m. Charles E. Billings, Robert Bason, Donald K. Mathews, and Edward L. Fox (Ohio State University, Columbus, Ohio). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 406-408. 6 refs. Contract No. DA-49-193-MD-2741.

Twenty-five males were studied during 20 days of continuous residence at an elevation of 3,800 m. They worked for up to 30 min at 1/2 or 2/3 of their sea-level (230 m) work capacity during 8 days at altitude. Oxygen uptake, ventilation, and heart rate were recorded several times during each work session. On the 17th and 19th days of exposure, maximal oxygen uptakes were determined. The time required to reach stable levels of oxygen uptake, ventilation, and heart rate during work did not change during 20 days at altitude. Terminal oxygen uptakes and ventilation volumes during work at 1/2 of sea-level capacity were higher on the 2nd and 5th days than at other times, while terminal heart rates declined steadily for 11 days. Work which required oxygen uptakes greater than 2.5 1/min at 230 m was always associated with lower oxygen uptakes at 3,800 m. (Author)

A71-23369 Regulation of sweat secretion during positive and negative work. Kenneth A. Smiles and Sid Robinson (Indiana University, Bloomington, Ind.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 409-412. 9 refs. Contract No. DA-49-193-MD-2449.

Experimental study of the possible influence of speed of walking on sweat secretion during positive and negative work. Metabolic and work rates were examined in two subjects who carried loads on packboards at each of three speeds during upgrade and downgrade walking on a treadmill in a cool environment. It was found that sweat secretion could be predicted as accurately from the speed of walking and metabolic rate as from metabolic rate and the external work performed by the subjects (upgrade) or on the subjects (downgrade). It is concluded that a stimulus of neuromuscular origin is an essential part of the thermoregulatory system in man during work. O.H.

A71-23370 * Parabiotic dialysis - Its usefulness as an experimental tool. J. A. Pauze and J. P. Gilmore (Virginia, University, Charlottesville, Va.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 420-423. 9 refs. NASA-supported research; NIH Grant No. HE-11387-02.

The technique of parabiotic dialysis in which one animal is dialyzed against a second animal is described. To determine its possible usefulness as an experimental tool, this technique was applied to the dialysis of animals of the same and different species as well as functionally nephrectomized animals. The results indicate that parabiotic dialysis may be a useful technique in the study of in vivo diffusable substances as well as an alternative technique to conventional chronic hemodialysis. (Author)

A71-23371 * Left and right ventricular pressures in mice. Raj Kumar, Richard Wagner, Marjorie L. Slankard, and Walter H. Abelmann (Boston City Hospital; Harvard University, Boston, Mass.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 424-426. 8 refs. NIH Grants No. HE-5244; No. HE-10539; Grant No. NGR-22-007-019.

A technique of transthoracic measurement of intraventricular pressures and dp/dt, suitable for anesthetized small animals, has been developed and applied to several strains of mice. In anesthetized Harvard Swiss mice left ventricular systolic pressures were 21% higher by transthoracic technique compared to the standard thoracotomy technique. In anesthetized C3H mice ventricular pressures were measured by transthoracic technique using a fiberoptic system and a strain-gauge pressure manometer. Left and right ventricular systolic and end-diastolic pressures (mean plus or minus SD) were 100 plus or minus 11/2 plus or minus 1.3 and 21 plus or minus 3.8/1.0 plus or minus 1.0 mm Hg, respectively, by the fiberoptic system. The pressures measured by the strain-gauge manometer were identical. However, the limited frequency response of the strain-gauge manometer overemphasized certain harmonics contained in the ventricular waveform, resulting in 47-97% higher dp/dt for both ventricles. (Author)

A71-23372 **Predicting metabolic energy cost.** Baruch Givoni and Ralph F. Goldman (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 429-433. 17 refs.

Supplementing data from this laboratory on the energy costs of level or grade walking, with and without loads, with data from the literature, an empirical equation has been prepared for the prediction of the metabolic costs of such activities. The equation has been examined and found to be valid for walking speeds from 2.5 to 9 km/hr with grades up to 25% and running speeds from 8 to 17 km/hr with grades up to 10% with loads up to 70 kg. Modifying coefficients are suggested for terrains other than treadmill walking, for load placement, and for very heavy levels of work. The correlation between predicted and measured energy costs is usually 0.95 or greater; the mean standard error of estimate over all conditions is 29 kcal/hr. The equation also appears valid when the subject is free to choose his own progression rate. (Author)

A71-23373 * **Electronic bicycle ergometer - A simple calibration procedure.** J. H. Clark and J. E. Greenleaf (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Applied Physiology*, vol. 30, Mar. 1971, p. 440-442.

A description is given of a relatively simple technique for the direct calibration of an electronic ergometer. The procedure requires only standard shop and laboratory equipment: a machinist's lathe, a platform scale, an electronic counter/timer, and a strobe light. Construction of a separate drive assembly is not necessary. The ergometer was tested over a variety of operating conditions used in physiological experimentation. During test at high work loads, appreciable calibration errors were encountered. Measurements of control circuit outputs indicated that these errors were the result of an uncompensated decrease in output torque as temperature increased in the eddy current brake used as the ergometer load device. (Author)

A71-23412 # **Health and safety in laser applications.** Vernon E. Rose (U.S. Public Health Service, Bureau of Occupational Safety and Health, Cincinnati, Ohio). In: Laser technology: Welding, machining and safety; Proceedings of the Second Engineering Seminar on New Industrial Technology, Pennsylvania State University, University Park, Pa., July 7-9, 1969. (A71-23401 09-15) University Park, Pa., Pennsylvania State University (Engineering Proceedings P-46), 1970, p. 112-117. 11 refs.

Discussion of criteria for the prevention of injury from laser operations. It is pointed out that it is necessary to recognize that the laser system contains three major potential hazards: thermal burns, photochemical burns, and electric shock. There are several other associated hazards. Each laser system must be evaluated in its own right as to appropriate safety and health requirements to control potential hazards. Potential hazards can be controlled by proper design, installation, and operation of the laser system, and should be monitored by appropriate preemployment examination and regularly scheduled physical examination of employees. Education in safety requirements begins with the initial decision to use a laser system, continues as long as the system is in use, and involves everyone concerned with the system. M.M.

A71-23413 # **Laser safety in an industrial environment.** Roy Kinslow (Texas Instruments, Inc., Dallas, Tex.). In: Laser technology: Welding, machining and safety; Proceedings of the Second Engineering Seminar on New Industrial Technology, Pennsylvania State University, University Park, Pa., July 7-9, 1969. (A71-23401 09-15) University Park, Pa., Pennsylvania State University (Engineering Proceedings P-46), 1970, p. 118-138.

Discussion of the hazards presented by lasers and of the safety precautions to be adopted by industry. Some of the minimum laser safety precautions suggested are: laser laboratory operating environments should have walls, ceilings, and fixtures of dull finish, free of reflections; laser laboratories or production areas should have restrictive admittance procedures, including locked doors or other effective personnel barriers; all personnel in laser work areas should wear special goggles; laser personnel must never look down the beam of any laser, and reflected laser energy should be regarded with as much caution as the main beam; the laser beam or pulse should not be allowed to fall on any part of the body, since physiological reactions are unknown; and laboratory personnel regularly working in laser environments should have initial and periodic ophthalmological examinations. M.M.

A71-23414 # **Current status of laser threshold guides.** Charles H. Powell (Missouri, University, Columbia, Mo.), H. E. Bell, V. E. Rose, L. Goldman, and T. K. Wilkinson. In: Laser technology: Welding, machining and safety; Proceedings of the Second Engineering Seminar on New Industrial Technology, Pennsylvania State University, University Park, Pa., July 7-9, 1969. (A71-23401 09-15) University Park, Pa., Pennsylvania State University (Engineering Proceedings P-46), 1970, p. 139-147. 11 refs.

Review of the most widely accepted and quoted limits for laser exposure in the U.S. The USAF permissible exposure levels for collimated laser radiation for the eye, at level of cornea, are tabulated, together with a comparison of recommended laser threshold values for the eye and skin. In the recommended values for exposure of the eye to Q-switched, non-Q-switched, and CW laser radiation, a range of a thousandfold is observable. For the most part, however, the range in values extends for the community and the employed population with variations of only a factor of 10. M.M.

A71-23472 **Heterotrophic growth of blue-green algae in dim light.** Chase Van Baalen, Derek S. Hoare, and Ellen Brandt (Texas, University, Port Aransas and Austin, Tex.). *Journal of Bacteriology*, vol. 105, Mar. 1971, p. 685-689. 18 refs. Research supported by the Robert A. Welch Foundation; NSF Grants No. GB-8641; No. GB-8178; PHS Grant No. FR-07091.

A unicellular blue-green alga, Agmenellum quadruplicatum, and a filamentous blue-green alga, Lyngbya lagerheimii, were grown heterotrophically in dim light with glucose as major source of carbon and possibly energy. The dim-light conditions did not support autotrophic growth. The two blue-green algae appeared to have the same metabolic block, namely an incomplete tricarboxylic acid cycle, as has been found in other obligately phototrophic blue-green algae. Under dim-light conditions, glucose made a greater contribution to cell constituents (amino acids) of A. quadruplicatum and L. lagerheimii than under high-light conditions. (Author)

A71-23473 * **Division cycle of Myxococcus xanthus. III - Kinetics of cell growth and protein synthesis.** David Zusman, Peter Gottlieb, and Eugene Rosenberg (California, University, Los Angeles;

California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Journal of Bacteriology*, vol. 105, Mar. 1971, p. 811-819. 18 refs. NSF Grant No. GB-8708.

Determination of the kinetics of cell growth and protein synthesis during the division cycle of Myxococcus xanthus. The distribution of cell size for both septated and nonseptated bacteria was obtained by direct measurement of the lengths of 8,000 cells. The rate of protein synthesis during the division cycle was measured by pulse-labeling an exponential-phase culture with radioactive valine or arginine and then preparing the cells for quantitative autoradiography. Nondividing cells showed an increase in both the absolute and specific rates of protein synthesis throughout the growth phase; the specific rate of protein synthesis for dividing cells was low when compared to growth-phase cells. Cell growth and protein synthesis are compared to the previously reported kinetics of deoxyribonucleic acid and ribonucleic acid synthesis during the division cycle. M.M.

A71-23474 Chromosome mapping of Pasteurella pseudotuberculosis by interrupted mating. William D. Lawton and Harold B. Stull (U.S. Army, Biological Sciences Laboratories, Fort Detrick, Md.). *Journal of Bacteriology*, vol. 105, Mar. 1971, p. 855-863. 15 refs.

Pasteurella pseudotuberculosis, containing the Escherichia coli plasmid F'lac, transferred its chromosome in an oriented manner to each of five multiply auxotrophic strains of P. pseudotuberculosis. In a mating system containing gelatin, glucose, and phosphate buffer, a maximum of 0.02% of the donor cells transferred lead markers. The entry time of seven markers was established. The experimental data suggest that the Pasteurella chromosome is transferred in more than one linkage group. M.M.

A71-23475 Nitrogenase activity in cell-free extracts of the blue-green alga, Anabaena cylindrica. R. V. Smith and M. C. W. Evans (King's College, London, England). *Journal of Bacteriology*, vol. 105, Mar. 1971, p. 913-917. 30 refs. Research supported by the Science Research Council and the University of London.

Study of cell-free extracts with high nitrogenase activity prepared by sonic oscillation and French press treatment from the blue-green alga Anabaena cylindrica. Extracts were prepared from cells grown on a 95% N2-5% CO2 gas mixture followed by a period of nitrogen starvation under an atmosphere of 95% argon-5% CO2. No increase in the specific activity of extracts was achieved by breaking heterocysts. Activity (assayed by acetylene reduction) was found to be dependent on adenosine triphosphate (ATP), an ATP-generating system, and a low-potential redundant. Na2S2O2 employed as reductant supports higher rates of nitrogenase activity than reduced ferredoxin. The activity is associated with a small-particle fraction that can be sedimented by ultracentrifugation. In contrast to the particulate nitrogenase of Azotobacter, which is stable in air, the A. cylindrica nitrogenase is as oxygen sensitive as nitrogenase prepared from anaerobic bacteria. (Author)

A71-23541 Effect of body metabolism on cardiac output - Role of the central nervous system. Manuel Banet and Arthur C. Guyton (Mississippi, University, Jackson, Miss.). *American Journal of Physiology*, vol. 220, Mar. 1971, p. 662-666. 12 refs. NIH Grants No. HE-08375; No. HE-11678.

Experimental investigation of the simultaneous hemodynamic and metabolic effects of 2,4-dinitrophenol (DNP) in decapitated dogs with the spinal cord destroyed in order to study the role of the central nervous system in cardiac output regulation when body metabolism is increased. When arterial pressure was stabilized in the decapitated dogs by autoinfusion of blood or a mixture of blood and dextran, the results were almost identical with those of the intact control animals. It is concluded that the ability of the cardiovascular reflexes to prevent both pooling of blood in the peripheral circulation and also to prevent decreased arterial pressure is essential for a full cardiac output response to increased body metabolism. M.M.

A71-23542 Regional circulatory responses to arterial hypoxia in the anesthetized dog. John A. Krasney (Union University, Albany, N.Y.). *American Journal of Physiology*, vol. 220, Mar. 1971, p. 699-704. 26 refs. PHS Grant No. HE-11982-02.

In dogs under morphine-chloralose anesthesia, ventilation with 6% O2-94% N2 provoked a rise in mean aortic blood flow as measured by electromagnetic flowmeter. This response appeared to occur irrespective of conditions of ventilation or relative level of chemoreceptor control of the circulation. Aortic flow was increased in association with increased heart rate in the spontaneously breathing dog, while an augmented stroke volume was favored during hypoxia induced under controlled artificial ventilation and after sinoaortic denervation. Superior caval flow was enhanced at the expense of inferior caval flow during hypoxia in intact animals. Analysis of common carotid and superior mesenteric flows indicates that the peripheral vascular response to arterial hypoxia represents both vasoconstrictor and vasodilator components. Local flow is altered variably in hypoxia, depending on the relative balance of these two mechanisms. M.M.

A71-23543 Hypertension and tissue metal levels after intraperitoneal cadmium, mercury, and zinc. H. Mitchell Perry, Jr. (Washington University, St. Louis, Mo.) and Margaret Erlanger (Cochran Veterans Administration Hospital, St. Louis, Mo.). *American Journal of Physiology*, vol. 220, Mar. 1971, p. 808-811. 17 refs. Research supported by the U.S. Veterans Administration.

Experimental investigation in which intraperitoneal injection of cadmium ion in rats reproducibly induced prompt hypertension which persisted for at least 1 hr. After its administration, both blood pressure and tissue concentration of cadmium were measured. It is pointed out that, on the basis of the presently available data, it seems possible that the initial hypertensive effect of cadmium is mediated by the heart and involves cardiac output; whereas the later effects depend on a different mechanism, possibly the renin-angiotensin system or, possibly, direct constriction of peripheral vessels. M.M.

A71-23620 The effect of gravity and acceleration on the lung. D. H. Glaister (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). Research supported by the Medical Research Council. Slough, England, Technivision Services (AGARDograph No. 133), 1970. 217 p. 279 refs. $28.50.

Ventilation and the mechanics of breathing, distribution of ventilation, and the effects of acceleration on ventilation distribution are considered first. The effects of acceleration upon the cardiovascular system, regional distribution of blood flow, and distribution of pulmonary blood flow are then discussed in detail. Particular attention is given to acceleration atelectasis because of its unique position in aviation medicine. The relationships between regional ventilation and perfusion, and their effect on gas exchange, are also examined. Finally, the effect of acceleration on gas exchange, arterial oxygen saturation and, in particular, pulmonary shunting, is considered. O.H.

A71-23621 An assessment of display design for aircraft applications - A developing crisis. John H. Kearns, III (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio) and William F. Swartz (Bunker-Ramo Corp., Canoga Park, Calif.). *Information Display*, vol. 8, Mar.-Apr. 1971, p. 25-28.

The present situation in the field of aircraft display designs is discussed with the emphasis on the challenges facing this branch of technology in finding a way out of its current state of developing crisis due to a lack of unity in handling the controversial man-

machine problem. The failure of current aircraft displays to meet the requirements of a more-machine-controlled flight is indicated. Insufficient understanding of the pilot's job and the absence of an oriented methodology for ordering the display science are blamed in part for this failure. Knowledgeable commitment to display design demands and the creation of interdisciplinary teams with problem-oriented individuals are suggested to facilitate the progress in this field. V.Z.

A71-23744 Reduction or disappearance of visual after effect of movement in the absence of patterned surround. R. H. Day and E. Strelow (Monash University, Melbourne, Australia). *Nature,* vol. 230, Mar. 5, 1971, p. 55, 56. 11 refs.

The effect of a surround on the apparent movement of stationary patterns in the opposite direction to their immediately preceding real movement is investigated. The first experiment conducted followed the chance observation that after fixation of the target in darkness there was little or no movement aftereffect. In an experiment with twelve subjects it was found that there was no significant difference in the movement aftereffect produced when the surround pattern consisted of regularly arranged dots, concentric circles, a grid pattern, or vertical bars. G.R.

A71-23747 * Effect of Apollo 11 lunar samples on terrestrial microorganisms. Melvin P. Silverman, Elaine F. Munoz, and Vance I. Oyama (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Nature,* vol. 230, Mar. 19, 1971, p. 169, 170. 17 refs.

Description of the results of experiments designed to test Apollo 11 lunar samples for inhibition of the growth of terrestrial microorganisms in conditions resembling as closely as possible those used in the earlier search for living organisms in Apollo 11 lunar material. No inhibition was found of the growth of any of the organisms tested by either of the two lunar samples used; all cultures formed lawns of confluent growth on agar media contiguous with the lunar material. The findings warrant the conclusion that iron probably was leached from the Apollo 11 bulk fines and core samples in concentrations that affected pigment production in Serratia marcescens and Pseudomonas aeruginosa but without discernible adverse effect on the growth of these or any of the other terrestrial microorganisms tested. M.M.

A71-23753 Space medicine (Weltraummedizin). E. H. Graul. Berlin, Verlag Ullstein GmbH, 1970. 283 p. In German. $6.62.

Aspects of interaction between space exploration and a number of fields of modern medicine and the life sciences are examined. Reasons for manned space exploration are discussed, and questions of astronaut selection and training are investigated. Problems of defining the upper boundary of the terrestrial atmosphere and the beginning of space are considered. Stresses on the human organism produced during the ascent into space are explored. Effects of the absence of gravity on the astronauts are described, and various approaches for reducing these effects are considered. Problems of working in space are investigated. Biological effects of radiation of various types are examined. Various aspects connected with life in a spacecraft are discussed giving attention to a comparison of space available to a person in various situations, to the composition of the spacecraft atmosphere, to the maintenance of a suitable temperature, and to nutritional problems. Space suit design and aspects of medical supervision in space are considered. Data processing capacities and aspects of reliability in making decisions for man and machine are compared. Problems connected with life in space stations and during manned voyages to the planets are discussed. The design of a lunar station is considered, and possibilities and difficulties regarding the flight to other stars are critically examined. G.R.

A71-23880 Biotelemetric assessments of the cardiac circulatory system of G-91 jet pilots in flight for determination of different flight stresses (Transition and photographic mission) (Biotelemetrische Untersuchungen des Herz-Kreislauf-Systems bei G-91-Jet-Piloten während des Fluges zur Feststellung der unterschiedlichen fliegerischen Belastung /Transition und Fotomission/). H. Hoffmann, W. Schmücking, M. Koch, and W. Meier (St.-Johannes-Hospital, Dortmund; Medizinische Universitätsklinik, Bonn, West Germany). *Zentralblatt für Verkehrs-Medizin, Verkehrs-Psychologie, Luft- und Raumfahrt-Medizin,* vol. 16, Dec. 1970, p. 129-165. 28 refs. In German.

Flight tests of 46 jet pilots were carried out with the objective of obtaining a better understanding of the flight stresses experienced by pilots of small jet aircraft during normal flight operations. Biotelemetric equipment was used to transmit data on pulse frequency, respiratory frequency, electrocardiographic findings, as well as the flight altitude and velocity. The results which characterize flight stresses during takeoffs, landings, acrobatic flight, precision flight maneuvers, and photographic missions are presented and evaluated. It is found that during takeoffs and landings, the pilots are subjected to psychical stresses only, whereas during acrobatic flights physical stresses prevail due to acceleration of gravity. During photographic missions, both psychical and physical stresses occur. O.H.

A71-23894 Influence of chronic and acute hypoxia on oxygen affinity and red cell 2,3 diphosphoglycerate of rats and guinea pigs. R. Baumann, Ch. Bauer, and H. Bartels (Hannover, Medizinische Hochschule, Hanover, West Germany). *Respiration Physiology,* vol. 11, Jan. 1971, p. 135-144. 27 refs.

Measurement of whole blood oxygen half-saturation pressure (P sub 50) and 2,3 diphosphoglycerate (2,3 DPG) concentration in albino rats and guinea pigs near sea level (Hannover), after short (36 hr) and prolonged (3 months) exposure to a simulated altitude of 4000 m in a low-pressure chamber. To determine the influence of 2,3 DPG on the oxygen affinity P sub 50 was measured in dialyzed solutions of rat and guinea pig hemoglobin before and after addition of 2,3 DPG. After short and prolonged exposure to 4000 m whole blood P sub 50 and 2,3 DPG concentration were significantly higher than at sea level for both species. Addition of 30 micromoles 2,3 DPG/g Hb to the dialyzed solutions of rat and guinea pig hemoglobin increased P sub 50 by 13.6 and 8.8 mm Hg, respectively. The effectiveness of a decrease in oxygen affinity as an adaptive mechanism and the causes for the increase in 2,3 DPG at high altitude are discussed. (Author)

A71-23895 Estimates of the CO2 pressures in systemic arterial blood during rebreathing on exercise. D. Denison, R. H. T. Edwards, G. Jones, and H. Pope (Royal Postgraduate Medical School, London, England). *Respiration Physiology,* vol. 11, Jan. 1971, p. 195-196. 30 refs. Research supported by the Medical Research Council of England.

Analysis of blood sampled from the brachial arteries of three subjects on 120 occasions before or during prolonged rebreathing of CO2 in O2 mixtures. Studies were made at rest and during three grades of exercise (300 to 900 kpm/min). The CO2 tension in rebreathed gas was consistently higher than that measured in arterial blood and the difference increased with the level of exertion, but at steady loads it did not change with time. The CO2 contents of 45 samples were measured on the same occasions. Their tension-content coordinates fell on the in vitro dissociation curves of normal blood. Previous studies on the same subjects had shown a similar discrepancy between rebreathed gas and pulmonary arterial blood. In spite of these findings the indirect Fick method, based on rebreathing estimates of the mixed venous CO2 partial pressure and end-tidal estimates of the arterial CO2 partial pressure yields values for cardiac output which closely agree with those obtained in direct Fick and dye dilution studies published by others. The interpretation of oxygen based estimates of cardiac output is also discussed. (Author)

A71-23896 Indirect determination of mean whole body and intracellular CO2 and buffer capacity. C. Albers, O. Ludwig, W. Usinger, and P. Spaich (Regensburg, Universität, Regensburg; Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany). *Respiration Physiology,* vol. 11, Jan. 1971, p. 197-210. 29 refs.

The DMO method of Waddell and Butler (1959) was used to determine mean whole body intracellular pH in artificially ventilated dogs at different arterial CO2 tensions. The mean regression lines are presented. Formulas are derived to convert these lines into CO2-combining curves and buffer curves of the extracellular and intracellular compartment. Values of pH, HCO3(-), total CO2, and buffer capacity are given for arterial CO2 tension equal to 40 torr for the intracellular and extracellular space and for the whole body. It is found that the intracellular space contributed 57% of these values. Position and slope of the calculated CO2 combining curve agree well with pertinent data of the literature based on direct tissue analysis, CO2 elimination experiments, or distribution kinetics of radioactive CO2. O.H.

A71-23897 Effect of temperature on the intracellular CO2 dissociation curve and pH. C. Albers, W. Usinger, and P. Spaich (Regensburg, Universität, Regensburg; Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany). *Respiration Physiology,* vol. 11, Jan. 1971, p. 211-222. 28 refs.

Mean whole body intracellular and extracellular pH were determined at different arterial CO2 tensions in two groups of dogs maintained at a body temperature of 41.6 and 27.1 C. From the data HCO3(-), total CO2, and buffer capacity were calculated for the extracellular and intracellular fluid. The mean regression equations obtained for the hyperthermic and hypothermic group are presented. Total CO2 and HCO3(-) were found to be appreciably higher in the hypothermic group than in the hyperthermic group. At constant CO2 tension per deg C, the temperature effect was about 1% CO2 content for the extracellular fluid, and 3% for the intracellular fluid. It is shown that the effect of temperature on the relative alkalinity of the intracellular fluid expressed as the OH(-)/H(+) ratio would be minimal when the temperature change is done at constant extracellular pH rather than at constant total CO2. O.H.

A71-23898 The rate of approach to *equilibrium* in uncatalyzed CO2 hydration reactions - The theoretical effect of buffering capacity. B. A. Gray (Dartmouth College, Hanover, N.H.). *Respiration Physiology,* vol. 11, Jan. 1971, p. 223-234. 15 refs. Research supported by the Life Insurance Medical Research Fund; NIH Grant No. HE-02888-12.

Treatment of the kinetics of the uncatalyzed reaction of CO2 and H2O with particular reference to the rate of equilibration in an open system at constant CO2 partial pressure under conditions of different buffering capacities. The treatment is based on the accepted first-order kinetics of the hydration and dehydration reactions and characterizes the strong dependence of the time course of the equilibration process on the buffering capacity. The computed half-times are found to vary from 0.3 to 30 sec as the buffering capacity increases from 0.2 mM/pH unit (a solution devoid of nonbicarbonate buffer) to 40 mM/pH unit. An appendix is included which describes the computation method. (Author)

A71-23899 Morphometric estimation of pulmonary diffusion capacity. II - Effect of P sub O2 on the growing lung - Adaptation of the growing rat lung to hypoxia and hyperoxia. P. H. Burri and E. R. Weibel (Bern, Universität, Berne, Switzerland). *Respiration Physiology,* vol. 11, Jan. 1971, p. 247-264. 56 refs. Schweizerische Nationalfonds zur Förderung der Wissenschaftlichen Forschung Grant No. 3.5.68.

To investigate the influence of environmental O2-tension on postnatal lung growth, 3 groups of rats were exposed to hypoxic, normoxic and hyperoxic atmospheres from the 23rd to the 44th day of their life, the respective PO2 being 100, 150, and 290 mm Hg. Under hypoxic conditions the lung volumes were increased. This could be attributed to parallel increases in alveolar, capillary and tissue volumes. Hyperoxia diminished these volumes by about 16%. The experiments provide evidence that O2 tension of ambient air influences postnatal growth of the lung during the growth period investigated. M.M.

A71-23923 Phase lag in periodic Coriolis star nystagmus. M. Valentinuzzi (Chicago, University, Chicago, Ill.). *Medical and Biological Engineering,* vol. 8, Nov. 1970, p. 559-574. 22 refs. NIH Grant No. 2 R-01-NB-01330.

Experimental investigation of the phase lag which exists between each Coriolis input and the corresponding ocular component. Periodic Coriolis star nystagmus was produced in normal and unilabyrinthectomized cats. The phase lags of the horizontal and the vertical components were measured and plotted against the angular frequency of the applied horizontal rotation. An empirical exponential function was fitted to the experimental values in order to smooth their distribution. Taking these curves as a basis, the values of the quotients between the coefficients of the differential equation for the semicircular canal, and that of the damping factor, were estimated for the horizontal and the vertical semicircular canals. The value of the damping factor shows that the system is overdamped. A comparison between the nystagmic responses to separate and to simultaneous stimulation of the horizontal and vertical canals suggests that an important utricular hydrodynamic coupling might exist. O.H.

A71-23929 The development of a questionnaire for research and diagnostics in the personality domain (Die Entwicklung eines Fragebogens für Forschung und Diagnostik im Persönlichkeitsbereich). Helmut Kirsch (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Hamburg, West Germany). *DFVLR-Nachrichten,* Mar. 1971, p. 150-152. In German.

Approaches for the measurement of personality traits are discussed taking into account a determination of the intensity of a certain trait in an individual on the basis of the answers to a number of appropriately phrased questions in a questionnaire. Problems of the reliability of the test results are investigated, and the design of a personality model by a suitable evaluation of questionnaire data is considered. Questions of specificity and generality regarding test results are explored, and a brief account of some practical experience obtained with a questionnaire is given. G.R.

A71-23969 * Effects of prolonged continuous exposure to 100% oxygen at 450 mm Hg in vivo on lipid synthesis in rat liver and adipose tissue slices. D. D. Feller, E. D. Neville, and K. S. Talarico (NASA, Ames Research Center, Moffett Field, Calif.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 136, Mar. 1971, p. 928-933. 14 refs.

Male rats were exposed to 100% oxygen at 450 mm Hg for periods of time from 1 to 3 weeks. After exposure, blood lipid assays were performed and in vitro incorporation of acetate-2-(14)C into CO2 and fatty acids by slices of liver and epididymal adipose tissue was measured. The oxygen-exposed rats gained a greater amount of weight over the exposure period than did their isocalorically, pair-fed controls. Plasma lipid values obtained from oxygen-exposed rats were higher than those obtained from the pair-fed group. Fatty acid contents in liver and adipose tissue of the oxygen-exposed rats were higher than those obtained from the pair-fed control rats. The possibility that the oxygen-enriched environment alters the utilization of foddstuffs in a manner which more efficiently conserves energy by the storage of greater amounts of fat and/or greater synthesis of lipids is discussed. M.M.

A71-23970 # **Effect of hypoxia and hypercapnia alone and in combination upon the circulating red cell volume of rats.** William E. Pepelko (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 136, Mar. 1971, p. 967-971. 23 refs.

Three groups of rats each were exposed for periods of up to 24 days to either hypoxia, hypercapnia, or a combination of hypoxia and hypercapnia. The combined condition resulted in a much smaller rise in circulating red cell volume per body weight than in rats exposed to hypoxia alone. The increase that did occur could be mainly attributed to a release of stored red cells into the circulation. During hypercapnia, plasma volume increased with only small changes in numbers of circulating red cells. This resulted in a depression of hematocrit. M.M.

A71-23983 **Evoked cortical responses to checkerboard patterns - Effect of check-size as a function of retinal eccentricity.** M. Russell Harter (North Carolina, University, Greensboro, N.C.). *Vision Research,* vol. 10, Dec. 1970, p. 1365-1376. 19 refs. Research supported by the University of North Carolina; NSF Grants No. GB-8053; No. GB-7324.

Visually evoked cortical responses were obtained from three subjects as they viewed checkerboard patterned light flashes presented to different areas of the retina in respect to the fovea. An inverted 'U'-shaped function was obtained between response amplitude and check-size. The check-size which elicited the greatest amplitude responses depended on eccentricity of retinal stimulation: when the foveal area was stimulated, relatively small checks evoked the greatest amplitude responses; when progressively more peripheral areas of the retina were stimulated, progressively larger check-sizes evoked the greatest amplitude responses. Check-size had little effect on evoked responses when the retina was stimulated 12.5 to 27.5 deg from the fovea. The results are discussed in relationship to the assumed size of retinal receptive field centers at different eccentricities in animals and humans. M.M.

A71-23984 **Dynamic visual acuity as an index of eye movement control.** N. H. Barmack (Rochester, University, Rochester, N.Y.). *Vision Research,* vol. 10, Dec. 1970, p. 1377-1391. 19 refs. PHS Grant No. MH-08034.

The dynamic visual acuity (DVA) of man and monkey was determined, and the associated horizontal eye movements were correlated with DVA. Monkeys have superior DVA, but inferior static visual acuity. The saccadic and smooth pursuit eye movements of monkeys are of shorter latency and higher velocity than those of man. Monkeys need only one saccade to attain a maximum smooth pursuit velocity of 140 deg/sec, whereas man needs two or more saccades to attain a smooth pursuit velocity of 90 deg/sec. It is probable that three factors determine DVA: (1) foveal visual acuity, (2) oculomotor control, and (3) parafoveal visual acuity. It is shown that monkeys have better oculomotor control than man, and it is inferred that monkeys have better parafoveal visual acuity. It is demonstrated that monkeys, like man, are capable of predictive eye tracking. M.M.

A71-23985 **Visual acuity with color discrimination without brightness discrimination (Sehschärfe bei Farbunterschieden ohne Helligkeitsunterschiede).** R. Hilz (München, Universität, Munich, West Germany) and C. R. Cavonius (Bethesda, Eye Research Foundation, Bethesda, Md.). *Vision Research,* vol. 10, Dec. 1970, p. 1393-1398. 12 refs. In German. NSF Grant No. GB-4260; Grant No. DA-DA-17-67-C-7121.

Measurement of visual acuity for gratings in which alternate sets of bars differed in wavelength, but not in luminance. It was found that this chromatic acuity increases with increasing wavelength difference, but does not reach as high values as achromatic acuity, contrary to earlier reports. M.M.

A71-23986 **Spectral sensitivity of the human VER obtained with an alternating barred pattern.** James G. May and John B. Siegfried (Houston, University, Houston, Tex.). *Vision Research,* vol. 10, Dec. 1970, p. 1399-1410. 9 refs. NIH Grant No. NB-07608.

Monopolarly recorded VERs (visual evoked responses) from the occiput were elicited with an alternating barred pattern composed of chromatic lights selected from across the spectrum. The amplitudes and latencies of averaged VERs were related to a series of different radiance levels, and spectral sensitivity curves were computed from criterion amplitude and latency measures. The resulting curves were in general agreement with psychophysically derived measures recorded in the same sessions and compared well with previously reported VER spectral sensitivity data. Local irregularities in the red are noted and discussed. M.M.

A71-23987 **Phi movement as a subtraction process.** S. M. Anstis (Bristol, University, Bristol, England). *Vision Research,* vol. 10, Dec. 1970, p. 1411-1430. 17 refs. Science Research Council Grant No. B/SR/4836.

Examination of how similar two successively presented patterns must be for phi movement to be perceived between them. Phi movement between two granular patterns, one being the photographic negative of the other, appeared to be reversed toward the direction of the earlier stimulus. Moving objects, displayed on a TV picture which was made positive and negative on alternate frames, appeared to move backward. It is concluded that phi movement was perceived between nearby points of similar brightness, irrespective of form or color. Phi movement was studied between two positive random-dot Julesz patterns. Pairs that gave stereo when presented dichoptically also gave phi movement when presented alternatively to one eye. When one pattern was degraded with noise, both stereo and phi broke down at the same noise level. It is concluded that phi, like stereo, depended on point-by-point comparison of brightness between two patterns. It could precede the perception of form. M.M.

A71-23988 **Modification of eye movements by instantaneous changes in the velocity of visual targets.** N. H. Barmack (Rochester, University, Rochester, N.Y.). *Vision Research,* vol. 10, Dec. 1970, p. 1431-1441. 7 refs. PHS Grant No. MH-08034.

The question of how information concerning the motion of targets becomes manifested in eye movements was answered in the following way. Monkeys, previously taught to track visual targets, were exposed to targets whose velocity was instantaneously changed at varying intervals after the onset of target movement. Both saccadic and smooth pursuit eye movements could be altered by changes in target velocity introduced during the first 90 msec of target movement. A change in the velocity of the target could affect the size of a saccade occurring only 50 msec later. The results indicate that both saccadic and smooth pursuit eye movements are based on continuously processed information. M.M.

A71-23989 **Artificial movements of a stabilized image.** H. J. M. Gerrits and A. J. H. Vendrik (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *Vision Research,* vol. 10, Dec. 1970, p. 1443-1456. 7 refs.

Description of stabilization experiments in which an object, mounted in the rotor of a small electric synchronous motor, can be rotated eccentrically. This motor is fixed in a cap which is sucked onto the eyeball. In this way it was possible to imitate the drift, the saccadic and the tremor movements of the eye, and to study their influence on perception. It was found that drift imitating movements regenerate (fill in) a disappeared object. The movements imitating the saccades and tremor were never effective in restoring normal vision. The influence of the location on the retina was studied. The observed effects are analyzed according to the model of activity spread and spread preventing barriers. It is pointed out that, in normal vision, the drift is responsible for continued perception and that the tremor and saccades do not function for this purpose. M.M.

A71-23990 Structural color of the field of vision in the case of intermittent illumination of the eye in the frequency range between 33 Hz and the critical flicker frequency (Über die Strukturierung des Gesichtsfeldes bei intermittierender Belichtung des auges im Frequenzbereich Zwischen 33 Hz und der Flimmerverschmelzungsfrequenz). E. Welpe (München, Technische Hochschule, Munich, West Germany). *Vision Research,* vol. 10, Dec. 1970, p. 1457-1469. 42 refs. In German.

The structural color of the flicker field was studied experimentally in the violet and yellow regions of the spectrum. All observations were monocular. Both the yellow and violet areas appearing in the center of the visual field were found to enlarge with increasing light stimulus frequency and vice versa. The yellow area always shows in the color of the stimulating light, whereas the color of the violet area is independent of the color of the stimulating light. Additional periodic electric stimulation of the eye causes a periodic alteration of the size of the violet and yellow area (similar to the ellipse phenomenon). V.P.

A71-23991 New model for interpreting the Stiles-Crawford effect (Un nouveau modèle destiné à l'interprétation de l'effet Stiles-Crawford). Jacques Simon (Paris, Université, Institut d'Optique, Orsay, Essonne, France). *Vision Research,* vol. 10, Dec. 1970, p. 1471-1476. 7 refs. In French.

In order to interpret the Stiles-Crawford effect, many authors have suggested solutions using geometrical optics, interferences or microwaves. It is shown that the scalar theory of diffraction can also explain this interpretation of the effect if the notion of relays lenses is introduced. An experiment illustrates this. From results of the diffraction and measurements of the Stiles-Crawford effect, the mean diameter of retinal cones which is consistent with previous results is calculated. M.M.

A71-23992 Temporal summation in foveal vision. R. Tittarelli and F. H. C. Marriott (Oxford University, Oxford, England). *Vision Research,* vol. 10, Dec. 1970, p. 1477-1481.

A series of experiments was made on a single subject to determine the absolute thresholds in foveal vision for light flashes of different durations, and for pairs of brief flashes at different separations. It is shown that the data for pairs of flashes can be explained by the assumption that the action of light on the cones causes a disturbance which decays with a half-life of the order of 20 msec, but that thresholds for long exposures are probably affected by random fluctuations in the retinal events. M.M.

A71-23997 A theory of form. D. J. H. Moore (Newcastle, University, Newcastle, Australia). *International Journal of Man-Machine Studies,* vol. 3, Jan. 1971, p. 31-59. 15 refs. Research sponsored by the Nuffield Foundation.

Description of a general theory of form, based on geometric probabilities. The theory solves the problem of perceiving, detecting, and extracting 'interesting' visual shapes from an 'uninteresting' background. The criteria for 'interesting' shapes are not subjective ones, but appear to be fundamental objective criteria upon which a general analytic theory of form can be based. The theory leads to the design of a two-dimensional, retinal-type computer which can be readily programmed to exhibit elementary, but fundamental, aspects of form perception. The computer has obvious applications in the field of pattern recognition. A pattern function theory is advanced to explain the alpha-rhythm of natural automata. An example of a cybernetic control system, based on pattern function theory, is also presented. O.H.

A71-23998 Toward balanced man-machine systems. Larry Press (Swedish Institute for Administrative Research, Sweden). *International Journal of Man-Machine Studies,* vol. 3, Jan. 1971, p. 61-73. 6 refs.

Description of a simple classification scheme for man-machine systems in which the question used for classification is which partner is giving instructions and which one is executing them. A strategy is suggested which extends a machine-only system to allow for interaction with and participation by a man, who must be enabled to input decisions and to request information to help him make those decisions. In order to more fully explicate this strategy, its application to the problem of experimenting with simulation models is analyzed. O.H.

A71-24121 Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970. 469 p. $28.80.

Normal and pathological anatomy of pulmonary hypertension; physical characteristics, rheology of blood, and flow patterns in pulmonary circulation; the effects of drugs and of physiological gases on the pulmonary circulation intact organisms, isolated lungs, and species differences; the effect of reduction of the pulmonary vascular bed; pumonary blood volume and its components: relationships between PBV and total blood volume; collateral circulation of the lung. Discussions of each section and a subject index are included. F.R.L.

A71-24122 Attempts to determine volume, compliance and resistance to flow of pulmonary vascular compartments. J. Piiper (Max Planck Institute for Experimental Medicine, Göttingen, West Germany). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 40-52. 11 refs.

Volume, resistance to flow and compliance of pulmonary vessels were investigated in isolated perfused lung lobes of small dogs using techniques that allowed subdivision of the total vascular bed into functional compartments (arterial, capillary and venous; preresistance and postresistance). The following more important results were obtained: (1) the vascular volume is distributed almost evenly to arteries, capillaries and veins or to preresistance and postresistance compartments; (2) the precapillary and postcapillary resistances are about equal. A great part of the resistance to flow is located in the capillaries; and (3) the compliance of the arterial compartment is close to that of the venous compartment. (Author)

A71-24123 Pressure volume relationship in the pulmonary circulation. A. Maseri (Pisa, Università, Pisa, Italy), A. Caldini, S. Permutt, and K. L. Zierler. In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 53-60. 23 refs.

Investigation of physiological basis of the SV (stroke volume)-PBV (pulmonary blood volume) relationship observed in normal human subjects, in a dog preparation allowing precise and independent control of flow, heart rate, and left atrial pressure. The role played by vascular recruitment and vascular distensibility in the observed changes of PBV, in a dog preparation allowing independent control of pulmonary artery and left atrial pressure, was also investigated. It was found that during acute changes, SV does not affect PBV per se, but only through changes of pulmonary artery pressure. In the range of pressures explored, changes of PBV appear to be essentially accounted for by vascular recruitment of parallel

vascular units, depending on the level of inflow pressure. The distensibility of these vascular units appears to be small. F.R.L.

A71-24124 The pulmonary vasoconstrictor response to acute hypoxia - Studies on mechanism and site of action. A. Hauge (Oslo, University, Oslo, Norway). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 145-155. 18 refs.

Use of isolated rat lungs perfused with heparinized homologous blood under conditions of constant volume pulsatile inflow to demonstrate the temperature dependency of the hypoxic response. To determine the nature of the mechanism released by pulmonary hypoxia, experiments were carried out with an arrangement of two isolated and separately ventilated pairs of rat lungs. These could be perfused either independently or in parallel, or in series (cross perfusion). It was thus possible to apply a low oxygen stimulus to a pair of lungs via the airways as well as via the blood. It appears that pulmonary arterial hypoxemia alone, without airway hypoxia, could not elicit a vasoconstrictor response. F.R.L.

A71-24125 Effects of hypoxia and hypercapnia on the repartition of pulmonary blood flow in supine subjects. J. Durand, M. Leroy Ladurie, and B. Ranson-Bitker (Centre Chirurgical Marie-Lannelongue, Paris, France). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 156-165. 21 refs. Research supported by the Centre Nationale de la Recherche Scientifique, the Institut National de la Santé et de la Recherche Médicale, and the Délégation Générale à la Recherche Scientifique et Technique.

Attempt to measure the effects of a gradual unilateral hypoxia on pulmonary blood flow partition and the interaction of hypoxia and hypercapnia. The distribution of pulmonary blood flow was measured by sudden injection of 85Kr in solution into the right atrium. Among the variety of stimuli studied, and considering the particular experimental conditions, oxygen and carbon dioxide are the only two which are efficient. They both act at the alveolar and/or postalveolar level, and the pulmonary circulation is not affected by their partial pressure or content in mixed venous or systemic arterial blood. The perfusion ratio is a linear function of PO2 in local pulmonary end-capillary or venous blood. The slope is a function of PCO2. The redistribution of blood leaving the hypoxic and/or hypercapnic areas of the lung is effective even for moderate hypoxia. F.R.L.

A71-24126 Regional pulmonary vasomotor activity in man. M. Arborelius, Jr., B. Lilja, and S. E. Lindell (Allmänna Sjukhuset, Malmö, Sweden). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 180-187. 13 refs. Research supported by the Swedish Association Against Heart and Chest Diseases.

The distribution of pulmonary flow in the sitting man was studied with the xenon 133 technique. It was found that the relative perfusion of the lung apices decreased with sitting time. Hypoxia induced by inhaling 10 percent in nitrogen or by breath-holding for 40 to 60 sec increased in relative perfusion of the lung apices. (Author)

A71-24127 Regulation of the pulmonary circulation. V. Lopez-Majano (Veterans Hospital, Baltimore, Md.). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 188-202. 138 refs.

Discussion of the pulmonary circulation, a low pressure-low resistance system in which the hydrostatic pressure regulates the pulmonary arterial blood flow, thus resulting in the upper part of the lungs being underperfused. General hypoxia such as that produced by breathing 12 per cent oxygen counteracts the effects of gravity. The ventilation of one lung with 10 per cent carbon dioxide (90% air or oxygen) resulted in a 6 per cent decrease of pulmonary arterial blood flow to the hypercarbic lung. Results indicate that respiratory gases regulate the pulmonary circulation to obtain a proper ventilation-perfusion relationship. Possible mechanisms are discussed. F.R.L.

A71-24128 The effect of age on the pressure-flow relationship and on the capacity of the pulmonary vascular bed with special reference to the condition of high flow. V. Staněk, J. Widimský, and J. Hurych (Institute for Cardiovascular Research, Prague, Czechoslovakia). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 375-384. 7 refs.

Study of some of the problems dealing with circulation during exercise. An attempt is made to add to the knowledge of the effect of aging on the pressures in the pulmonary circulation. The influence of increasing flow during supine exercise on the capacity of the pulmonary vascular bed, the influence of age on the pressure-flow relationship in the lesser circulation, and the response of cardiac output and right ventricular end-diastolic pressure to exercise in older patients with persistent increase in pulmonary arterial pressure are investigated. It is shown, as a result of examination of 16 young subjects and 16 subjects after pneumonectomy, that in general the increased cardiac output during supine exercise is accompanied by an increase in cardiopulmonary blood volume. It appears that, like the cardiac output and the cardiovascular compliance, the capacitance of the pulmonary circulation also diminishes with age. F.R.L.

A71-24129 The effect of age on pulmonary circulation in normal subjects. R. Messin, S. Degre, B. Demaret, P. Vandermoten, and H. Denolin (Saint-Pierre Hospital, Brussels, Belgium). In: Pulmonary circulation; European Society for Clinical Physiology of Respiration, International Symposium, Prague, Czechoslovakia, June 10-23, 1969, Proceedings. (A71-24121 10-04) Edited by J. Widimský, S. Daum, and H. Herzog. Basel, S. Karger AG (Progress in Respiration Research. Volume 5), 1970, p. 385-394. 10 refs.

Six normal subjects aged 35 to 51 were investigated at rest and during work loads performed in the sitting position on the bicycle ergometer. Oxygen consumption and cardiac output were measured concomitantly with pulmonary arterial pressure, using the floated catheter technique. The behavior of those parameters and of total pulmonary arterial resistance was compared with that observed by other authors in similar conditions in 6 subjects aged 18 to 40 and 10 subjects aged 61 to 83. It is concluded that no statistical differences could be found between the three groups in the material investigated. (Author)

A71-24162 # Hypothesis for the structure of fundamental processes in the visual system (Gipoteza o strukture osnovnykh protsessov v zritel'noi sisteme). D. I. Kirvelis. In: Current problems of cybernetics (Sovremennye problemy kibernetiki). (A71-

24155 10-10) Edited by Ia. Z. Tsypkin. Moscow, Izdatel'stvo Nauka, 1970, p. 251-262. 68 refs. In Russian.

Hypothetical model of the visual recognition process for simple achromatic images confined within simultaneous-perception viewing angles (less than 10 deg). The model is based on psychological studies of visual perception, anatomical and morphological data, electrophysiological research, and several theoretical solutions of pattern recognition problems. The model stipulates the existence of a sensory screen on which the image is projected by means of a neuron 'language.' The image is initially analyzed by deriving simple and complex, local and nonlocal indices. The results of this classification are projected on the sensory screen for comparison with the original image. After correcting the perception by this comparison, final recognition takes place or a search for another initial image is initiated. T.M.

A71-24163 # **Projectional relationships in the multichannel system of the cat's visual analyzer (Proektsionnye otnosheniia v mnogokanal'noi sisteme zritel'nogo analizatora koshki).** V. M. Krol' and A. G. Skripnikov. In: Current problems of cybernetics (Sovremennye problemy kibernetiki). (A71-24155 10-10) Edited by Ia. Z. Tsypkin. Moscow, Izdatel'stvo Nauka, 1970, p. 267-273. 13 refs. In Russian.

The propagation of visual images from the retina to the higher-level formations in the cat was studied by a technique which afforded local photostimulation of the eyes. The light pulses could be varied in dimensional extent, duration, and intensity. Reduction of the stimulus dimensions enabled individual stimulation of the nasal and temporal retinal regions in each eye for the purpose of studying signal propagation paths from these regions to the point of their convergence at the level of the corpus geniculatum laterale and the visual cortex. Additional neurosurgical operations permitted studies of visual analyzer functions when certain inputs were closed off. T.M.

A71-24164 # **Study of the functional organization of the motor center for the respiratory functional system (Izuchenie funktsional'noi organizatsii motornogo tsentra dykhatel'noi funktsional'noi sistemy).** Iu. N. Medvedev and A. D. Kirsanov. In: Current problems of cybernetics (Sovremennye problemy kibernetiki). (A71-24155 10-10) Edited by Ia. Z. Tsypkin. Moscow, Izdatel'stvo Nauka, 1970, p. 279-283. In Russian.

The integral activity of the motor-neuron system in the diaphragmatic center was studied by recording and analyzing phrenic-nerve signals in the rabbit. Experiments were performed both for natural breathing of anesthetized animals and for artificial respiration conditions. The results indicate the presence of a special mechanism which regulates the simultaneous activity of nerve elements in respiratory centers. T.M.

A71-24165 # **Study of the respiratory function when a biocontrolled stimulator is incorporated as an element of the respiratory system (Izuchenie dykhatel'noi funktsii pri vkliuchenii bioupravliaemogo stimuliatora v kachestve zvena dykhatel'noi sistemy).** K. D. Gruzdev and L. P. Tychkina. In: Current problems of cybernetics (Sovremennye problemy kibernetiki). (A71-24155 10-10) Edited by Ia. Z. Tsypkin. Moscow, Izdatel'stvo Nauka, 1970, p. 284-287. 8 refs. In Russian.

Study of the possibility of interfering in the coordinated activity of the respiratory system of a rabbit by incorporating a biocontrolled stimulator into the respiratory system. Three variants of incorporation of a stimulator into a system of natural nerve links of the respiratory act are described. The possibility of interfering in the process of self-regulation and obtaining different forms of coordinated activity of the respiratory system is shown. The theoretical possibility of functional prosthesis by gradual replacement of the natural elements of the respiratory system by artificial ones is demonstrated. A.B.K.

A71-24166 # **Development and study of a model of an excitable myocardium cell on a phase plane (Razrabotka i issledovanie na fazovoi ploskosti modeli vozbudimoi kletki miokarda).** A. A. Petrov. In: Current problems of cybernetics (Sovremennye problemy kibernetiki). (A71-24155 10-10) Edited by Ia. Z. Tsypkin. Moscow, Izdatel'stvo Nauka, 1970, p. 312-321. 9 refs. In Russian.

Development of a simplified model of an excitable heart muscle cell which fairly completely reproduces the processes occurring in a real cardiac cell and is easily realizable with the aid of the analog part of a hybrid computer complex. The proposed model is based on a principle deriving from an analysis of the equations for a physicochemical model of excitation phenomena on artificial membranes. The behavior of this simplified model of an excitable cell is described by means of a system of nonlinear differential equations with initial conditions. The problem of choosing the output signal of the model (the analog of the action potential of the cell) is shown to reduce to an appropriate choice of the coefficients and the nonlinear function in this system of equations to achieve reproduction of the main properties of an excitable myocardium cell by the model. To solve this problem, a study is made of the system of equations on the phase plane with the aid of the method of isoclines. A.B.K.

A71-24183 **Influence of temporal uncertainty and sensory modality of signals on watchkeeping performance.** Joel S. Warm (Cincinnati, University, Cincinnati, Ohio) and Earl A. Alluisi (Louisville, University, Louisville, Ky.). *Journal of Experimental Psychology,* vol. 87, Mar. 1971, p. 303-308. 15 refs. Grant No. DA-DA-17-68-C-8059; Contract No. DA-49-193-MD-2567.

The effects of signal density on the detection of increments in the duration of regularly occurring acoustic and visual pulses were assessed in a 1-hr watchkeeping task. Five levels of signal density (6, 12, 24, 48, and 96 signals/hr) were combined factorially with the two sensory modalities to produce a total of 10 experimental conditions. Overall performance efficiency, in terms of both detection probability and response time (RT) to correct detections, was greater for acoustic than for visual signals. Variations in signal density were not associated with significant changes in the probability of correct detections. On the other hand, RT increased as a linear function of signal surprisal due to density - an information measure of the temporal uncertainty of signals. (Author)

A71-24184 **Ambient temperature and the flicker-fusion threshold.** John M. Lockhart (U.S. Army, Pioneering Research Laboratory, Natick, Mass.). *Journal of Experimental Psychology,* vol. 87, Mar. 1971, p. 314-319. 14 refs.

Unprotected male subjects were exposed for 90 min to ambient temperatures of 40, 80 and 120 F with 35% relative humidity. After 1 hr of exposure, the flicker-fusion threshold (FFT) was determined using both the method of constant stimuli and the forced-choice procedure, with stimulus conditions of 35 and 95% of light to cycle at both 30 min and 2 deg visual angle. The sensory sensitivity effects of heat exposure on FFT are discussed in terms of a two-component retinal response to brightness changes of an intermittent light at FFT. M.M.

A71-24204 **Attentional processes in overtraining.** Vincent J. Tempone, Larry Decker (Arizona, University, Tucson, Ariz.), and Jack Capehart. *Perceptual and Motor Skills,* vol. 32, Feb. 1971, p. 127-132. 8 refs. NIH Grant No. 1 3516-01.

The effects of overtraining were examined using two dependent variables, choice response and eye fixations. Although an overtraining reversal effect was not found using choice-response, exami-

nations of a number of eye fixations both before and after reversal suggest that the introduction of reversal training produces greater shifts in attention in the overtrained (n = 6) as opposed to the criterion trained group (n = 6). Results are interpreted as supporting a theory of discrimination learning which proposes that S is developing a plan in which inputs are tested or compared against some centrally organized process. (Author)

A71-24205 Factors affecting the operation of Kundt's rule. Van Voorhees Lloyd (Wilson College, Chambersburg, Pa.). *Perceptual and Motor Skills,* vol. 32, Feb. 1971, p. 175-189. 21 refs. Research supported by the University of Melbourne; NSF Grant No. U-003064.

Experimental study of the effect of different variables on the bisection of figures under monocular viewing conditions. The variables studied included eye used, horizontal dimension of stimulus, and figure height or form (straight line, rectangle, or square). An analysis of variance showed that the different orders of judgments, subjects, eye used, and various interactions were significant sources of variation. The horizontal dimension of the stimulus and figure height or form yielded nonsignificant ratios. Some of the data of individual subjects provide evidence for the existence of either an improvement or a deterioration in performance, as the judgmental process continued. Various possible explanations of the findings are discussed and evaluated. O.H.

A71-24206 Effects of intermittent noise in visual search tasks of varying complexity. Harold D. Warner and Norman W. Heimstra (South Dakota, University, Vermillion, S. Dak.). *Perceptual and Motor Skills,* vol. 32, Feb. 1971, p. 219-226. 12 refs. Grant No. AF AFOSR 69-1822A.

Experiments were conducted in which subjects were assigned a task to search a display for a single letter located among a larger background of letters which were all the same but different from the single letter. Four noise ratios were utilized: 0, 30, 70, and 100% noise on-time in successive 5-sec intervals. Task complexity was varied by changing the number of background letters. Two difficulty levels were utilized: 8-letter and 32-letter displays. The results support the hypothesis that the particular effect attributable to varying ambient noise ratios on target detection time is dependent upon the degree of difficulty of the inspection task. It is shown that, relative to the control condition for that specific task level, the 30% noise ratio had a beneficial effect on the detection time for both the 8-letter and 32-letter task condition. The effect of the 70 and 100% noise ratios, however, was not consistent but changed from negative to positive as the level of complexity of the task increased from 8 to 32 letters. O.H.

A71-24207 Human time estimation - On differences between methods. Richard Duane McConchie and Jacques Rutschmann (Columbia University, New York, N.Y.). *Perceptual and Motor Skills,* vol. 32, Feb. 1971, p. 319-336. 12 refs. Research supported by Columbia University; NIH Grant No. NS-06767.

Study of the differences in judgments of short durations as obtained by the methods of reproduction, verbal estimation, and production in normal human subjects. Using the same eight standard intervals, male subjects made reproductions, verbal estimates, and productions in randomized blocks of trials according to a fixed complex order (sequence of methods, presentation of anchors). After presentation of anchors, significant differences between methods were still in evidence with respect to accuracy, intrasubject variability, and intersubject variability. The reliability of verbal estimates and of productions was decreased upon presentation of anchors, but in all methods, reliability increased over blocks of trials. Reliability of estimations and productions was significantly correlated with relative intersubject variability. As to association between judgments, verbal estimates and productions showed negative correlation while intercorrelations involving reproductions were not significant. O.H.

A71-24220 Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. Edited by H. E. von Gierke (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio), W. D. Keidel (Erlangen-Nürnberg, Universität, Erlangen, West Germany), and H. L. Oestreicher (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970. 478 p. In English and French. $25.

Adaptive control and learning systems are considered together with aspects of auditory and vibrotactile information processing, and visual and olfactory information processing. Methods, techniques, and functions in the field of motion and motion control are described. G.R.

A71-24221 # Bionics and bioengineering in aerospace research. Henning E. von Gierke (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 19-41; Discussion, p. 41. 35 refs.

The interrelation and overlap of the various interdisciplinary areas between the biological, physical and engineering sciences, which support man and his support equipment in aerospace flight are examined. Primary goals of bionics/bioengineering/cybernetics efforts in support of bioastronautics are discussed. These goals include the adaptation of man to environment, the adaptation of environment to man, and the matching of man and machine. Other goals are the extension of man's physical and intellectual capabilities by prosthetic devices in the most general sense, and the replacement of man by automata and intelligent machines. It is pointed out that practically all technological efforts aimed at replacing human capabilities by machines involve the general area of pattern recognition. Pattern recognition by the polynomial discriminant method, auditory pattern recognition, speech recognition, and aspects of information processing are among the subjects discussed. G.R.

A71-24222 On modelling the nervous system. M. A. Arbib (Stanford University, Stanford, Calif.). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 43-57. 26 refs. Grant No. AF AFOSR 1198-67.

An overview is provided of the functions of a cybernetic brain. The notion of neuroheuristic programming is introduced, and various modes of distributed information processing pertinent to modeling neuropsychological experiments are discussed. Studies are based on the single neuron as a unit in the overall structural basis of function, and aspects of reliability are taken into consideration. Various motives for modeling the nervous system are examined. G.R.

A71-24223 Principles of the processing of information by living systems (Principes du traitement de l'information par les systèmes vivants). A. E. Fessard (Institut Marey, Paris, France). In:

Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 59-72. 7 refs. In French.

It is pointed out that in biology the genetic transmission of biological characteristics, ontogenesis, organic control processes, and reactions to conditions in the environment involve informational concepts. One of the major characteristics of living organisms is the hierarchic superposition of the various organizational levels including atoms, molecules, cells, tissues, organic systems, individuals, and the continuous interaction between these levels. Molecular aspects of biological information are particularly important in genetics, enzymology, endocrinology, immunology, and pharmacology. Principles of operation of the nervous system and the brain are considered giving attention to neuron structures, aspects of message coding, programming, and information storage. G.R.

A71-24224 Information processing in biological and artificial brains. R. L. Gregory (Department of Machine Intelligence and Perception, Edinburgh, Scotland). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 73-80.

Approaches of utilizing the knowledge of biological systems for obtaining new technical possibilities are examined. The characteristics of the visual perceptual system are analyzed. It is suggested that this system has developed a set of strategies which give controlled output (behavior) though the input does not monitor immediately relevant features. Advantages of control via running internal models are evaluated, and the design of internal models for robots is discussed. G.R.

A71-24225 # Pattern recognition. Hans L. Oestreicher (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 81-97. 37 refs.

The concept of pattern recognition is defined as the categorization of a set of objects into classes. The class is the representative of certain 'properties,' which all members of this class have in common and which are useful to achieve a certain goal. In a pattern recognition system it is useful to distinguish a receptor stage, a preprocessing stage, and a decision making stage in which each incoming signal is categorized and assigned to one class. The recognition of printed characters and the recognition of speech sounds are considered to illustrate the problems involved in pattern recognition. Aspects of the characterization of classes and selection of features are examined, and the functions of preprocessing are discussed. Methods of classification with and without learning are investigated. G.R.

A71-24226 • Learning from the biological viewpoint. W. R. Adey (California, University, Los Angeles, Calif.). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 99-118. 63 refs. NIH Grants No. NB-01883; No. NB-2503; No. MH-03708; Contracts No. AF 49(638)-1387; No. Nonr-233(91); Grants No. NsG-237-62; No. NsG-502; No. NsG-505; No. NsG-1970.

Anatomy and physiology of cerebral ganglia are examined. It is suggested that in view of relations between the EEG in a domain of cerebral tissue and concurrent waves in contributing neuronal generators, particular significance would attach to consistent patterns of EEG waves accompanying acquisition and retrieval of learned habits. It is proposed that EEG wave activity may be associated with structural changes underlying storage of information in cerebral tissue. New evidence on the nature of the cerebral neuronal membrane is examined, and a model of neuronal organization in learning is discussed. G.R.

A71-24228 # Neurophysiological principles of auditory information processing. J. R. Mundie (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 173-195; Discussion, p. 196. 9 refs.

It is pointed out that the auditory system must have a very practical technique for analysis of nonstationary signals, a problem of considerable difficulty with presently available methods. An interpretation of the function of the mechanical action of the inner ear is presented. A mechanical transformation changes a two-dimensional pressure-time signal into three dimensions. The three-dimension surface is presented to the nervous system for further analysis. The interpretation of cochlear action presented suggests that it functions to segment, in a very special way, the signal in time and spatially disperse it. Auditory nervous system function is illustrated by the presentation of selected neurophysiological data, and a hypothesis for interpreting these data is offered. G.R.

A71-24229 Cerebral mechanisms of speech. R. C. Oldfield (Edinburgh, University, Edinburgh, Scotland). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 197-207. 14 refs.

The present state of knowledge regarding the cortical speech areas and their asymmetry is examined. It is pointed out that there is a difference between the form of speech and its linguistic content. Damage to the cortical centers usually produces damage at the linguistic level. Damage to other parts of the nervous system tends to produce disturbances in the form of speech. This generalization is not watertight however, as, for instance, patients with lesions in the neighborhood of Broca's area show disturbed articulation, rhythm and phonemic distortion. However, it is postulated that the cerebral speech apparatus may be divided into two parts. One is the cortical centers, which is similar to a set of interconnected computers, storing, analyzing and collating, encoding and decoding and making up sentences. The second is the centers of basal ganglia, whose functions seem to include regulation of tone, loudness, stress, and rhythm of speech. G.R.

A71-24230 Processing and recognition of speech (Traitement et reconnaissance de la parole). L. Pimonow (Ecole Pratique des Hautes-Etudes, Paris, France). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de

Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 209-229. 32 refs. In French.

Aspects of pattern and information recognition theory are considered, and the information involved in the classification of sound-emitting objects is examined. An analysis of the mechanism of hearing and of various technical systems is conducted. The progressive reduction of data performed in the course of information processing by the ear is considered. The time variation of the information rate imposed by the physiological properties of the ear is discussed, and the relation between this rate of variation and intelligibility is investigated. Differences between sound recognition and word recognition are emphasized. Approaches regarding a transformation of the spoken message for an application to the traces of hearing left in a deaf person are considered. G.R.

A71-24231 Vibrotactile information transfer. Jozef J. Zwislocki (Syracuse University, Syracuse, N.Y.). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 239-258; Discussion, p. 259. 26 refs. NIH Grant No. NC-03950-07.

Discussion of the similarities and differences between auditory and tactile vibration characteristics, and investigation of the vibrotactile potential for speech transmission. It is felt that if tactile characteristics could be made to coincide with those of hearing, tactile speech communication in real time might become possible. A number of systems for tactile speech transmission have been proposed. They represent attempts that must be regarded as groping in the dark, since tactile parameters are not yet sufficiently known. In order to fill the knowledge gaps, measurements of vibrotactile characteristics and analyses of the underlying processes are being performed. Some of the already investigated parameters are discussed. Known vibrotactile characteristics are contrasted from those of hearing. Possible transformations are suggested that could lead to an enhancement of the tactile capacity for speech transmission. M.V.E.

A71-24232 *Computer simulation of some visual functions.* Neville Moray (Sheffield, University, Sheffield, England). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 261-273; Discussion, p. 273, 274. 8 refs.

Simulations of lateral inhibitory networks were carried out, keeping as closely as possible to the values of the biological constants known from physiological work. The aim was to see whether such networks will produce figural aftereffects. Aftereffects were found, but the model was not quantitatively successful. A discussion of such networks shows that they provide a rapid dark and light adaptation mechanism, a brightness range compressor, and an image enhancer. M.M.

A71-24233 Neuronal models of pattern recognition, learning and size invariance mechanisms in the brain. W. K. Taylor (University College, London, England). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 275-289; Discussion, p. 289-291. 13 refs.

Description of the integration of mathematically defined model neurons and synapses into functional learning networks. The networks form a complete functional system representing retina, visual cortex, association areas and mid-brain feedback paths. Properties of a synthesized model include learning to read alphanumeric characters, handwritten words, and the recognition of complex random patterns and human faces. Size invariance is also a feature of the model, and it is shown that the postulated mathematical transformations lead to generalizations between size and distance whereby an object seen only at one distance in the past is recognized without further learning at any new distance. M.M.

A71-24234 Olfactory information processing and mechanisms. Andrew Dravnieks (IIT Research Institute, Chicago, Ill.). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 309-340. 137 refs.

Vapors from various sources contain information about a source's nature and state. Living organisms interpret these chemical signals by means of receptor systems that can be either highly specialized and sensitive, as in some insects, or be able to interpret many complex chemical signals. Much signal processing occurs at the receptor level. The systems discriminate between signals in terms of a limited number of dimensions, less than ten, having complex physicochemical correlates. The receptor mechanism involves intermolecular interactions of odorant molecules with the receptor membranes and probably uses sensor or discriminatory substances. Coding at the higher neural level uses stimulation, no effect or inhibition. M.M.

A71-24235 Biotechnique of oscillating propulsion systems and their integration into the body. H. Hertel (Berlin, Technische Universität, Berlin, West Germany). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 341-369.

Experimental investigation of biological propulsion systems using fish and water-channel models. Biomedical considerations led to a novel propulsion system by oscillating fins. Five models were investigated: (1) a plate propeller for ship propulsion in shallow water and for towing, (2) a plate propeller for pumping sludge, (3) an engine arrangement behind the fuselage for using the energy accumulated in the boundary layer; (4) low-drag fuselage shapes; and (5) underfloor installation of propulsion units in the fuselage of VTOL aircraft. M.M.

A71-24236 Method for the analysis of the neural mechanisms for postural adjustments. T. D. M. Roberts and D. J. Murray-Smith (Glasgow, University, Glasgow, Scotland). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 371-387. 11 refs.

Establishment of the laws of signal transformation by which the central nervous system constructs patterns of motor command from streams of sensory impulses. The pattern of motor commands to a limb extensor muscle in the cat in reflex response to rhythmic stretch is matched by computer simulation using a technique of parameter-sensitivity testing. The response alters during head tilting and the parameters of the model are adjusted to maintain the match. The required laws of signal transformation are those that predict the nature of the necessary parameter changes from the time course of the labyrinthine signal reporting the head tilt. F.R.L.

A71-24237 * Functions of the vestibular system in human guidance and control. L. R. Young (MIT, Cambridge, Mass.). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 389-406; Discussion, p. 407. 7 refs. Grants No. NsG-577; No. NGL-22-009-156; Contract No. AF 33(615)-5038.

Physical analog model of the vestibular system developed for research purposes. It consists of a three-gimbal head containing three rate gyroscopes and six linear accelerometers, and a special purpose analog computer simulating the dynamics and nonlinearities of the nonauditory labyrinth. The computer console permits adjustment of the important gains, nonlinearities, and time constants of the vestibular system for utility in refining models, training physiologists, predicting orientation perception or nystagmus, and to aid in design of moving base simulators or artificial g platforms. F.R.L.

A71-24238 The simulation of the heart's electrical generator system. P. Rijlant (Bruxelles, Université Libre, Brussels, Belgium). In: Principles and practice of bionics; NATO, AGARD, Bionics Symposium, Université Libre de Bruxelles, Brussels, Belgium, September 18-20, 1968, Proceedings. (A71-24220 10-05) Edited by H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher. Maidenhead, Berks., England, Technivision Services (AGARD Conference Proceedings, No. 44); Pelham, N.Y., Circa Publication, Inc., 1970, p. 477-484.

Simulation by dipolar or multidipolar generators which are continuously controlled by the actual generator system in the heart. The fundamental principle is the continuous comparison of the systems of the heart and the artificial generator, the difference signals being continuously utilized to modify and control the artificial generator. Equipment is described which provides very accurate appraisal of the major components of the overall electrical activity either in the normal heart or under modified or pathological conditions. F.R.L.

A71-24259 Toxicological investigation of aircraft accidents - Selected case reports from 450 fatal aircraft accidents. Delbert J. Lacefield and Paul W. Smith (FAA, Pharmacology-Biochemistry Laboratory). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 24-26, 1971, Paper 710395.* 5 p. Members, $1.00; nonmembers, $1.50.

The Pharmacology-Biochemistry Laboratory began to perform forensic toxicology in connection with investigation of fatal aircraft accidents in 1967. In 20% of the pilots involved in 450 accidents studied to date, drugs, alcohol, or carbon monoxide have been found at significant levels and may have contributed to the occurrence of the accident. This paper deals primarily with a group of miscellaneous findings which should be of interest to accident investigators and pilots: possible significance of cholinesterase measurements after fire, and of alcohol after immersion; pilots flying after refusal of licensure for medical reasons; complications introduced by passengers; negative findings when positive findings might have been anticipated; large quantities of drugs in pilot's possession. (Author)

A71-24260 Crashworthy personnel restraint systems for general aviation. Russell A. Hughes (Pacific Scientific Co., Commerce, Calif.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 24-26, 1971, Paper 710396.* 8 p. 5 refs. Members, $1.00; nonmembers, $1.50.

Effective personnel restraint systems incorporating upper torso restraint have been developed for general aviation. These systems stress safety, comfort, economy, ease of installation, and generation of user confidence. Inertia or force sensing reels and single point buckles are integral parts of the systems. The system for personal and private flying adds comfort and convenience to the familiar automotive type harness, while the system for business aircraft or other aircraft with structural seats utilizes the experience gained on thousands of commercial transport aircraft. (Author)

A71-24298 Annual biological clocks. Eric T. Pengelley and Sally J. Asmundson (California, University, Riverside, Calif.). *Scientific American,* vol. 224, Apr. 1971, p. 72-79.

The existence of endogenous daily clocks in certain plants and animals is discussed, and studies of hibernation indicating the existence of an annual clock are considered. The studies, conducted with ground squirrels, show that the circannual rhythm of consecutive hibernation is not influenced by the normal range of temperature. It is also demonstrated that hereditary characteristics rather than 'imprinting' in infancy are the source of circannual rhythm. Migratory birds are also found to display a circannual rhythm that is not influenced by length of day or change of temperature. Investigations with human subjects show a definite annual rhythm in man also. G.R.

A71-24326 Vitamin A deficiency effect on retina - Dependence on light. W. K. Noell, M. C. Delmelle, and R. Albrecht (New York, State University, Buffalo, N.Y.). *Science,* vol. 172, Apr. 2, 1971, p. 72-76. 24 refs. Research supported by the Buffalo Eye Bank and Research Foundation; NIH Grant No. EY-00297-05.

The effects of vitamin A deficiency in the rat eye, as measured by the electroretinogram and changes in rhodopsin content, are critically dependent upon the levels of illumination to which the animals are exposed daily. Depleted animals kept in darkness maintained virtually normal electroretinogram function and rhodopsin content for 5 to 6 months while those kept in weak cyclic light lost rhodopsin continuously. A fraction of the retinol released from rhodopsin during illumination disappears presumably from the pigment epithelium into the blood and becomes unavailable for rhodopsin regeneration. A sequence of three first-order reactions was assumed to estimate the rate constant of this disappearance (0.03 per hour). Computer simulation supporting the experimental data illustrates the dependence of the retinal abnormalities on light. (Author)

A71-24327 Irreversible effects of visible light on the retina - Role of vitamin A. W. K. Noell and R. Albrecht (New York, State University, Buffalo, N.Y.). *Science,* vol. 172, Apr. 2, 1971, p. 76-80. 19 refs. Research supported by the Buffalo Eye Bank and Research Foundation; NIH Grant No. EY-00297.

Diffuse retinal irradiation by visible light produces in the rat the death of visual cells and pigment epithelium. Typically, cage illumination of 1500 lux from fluorescent light through a green filter leads to severe damage when continued for 40 hours. Vitamin A deficiency protects against this damage but experiments show that retinol released by light from rhodopsin is probably not the toxic agent. Protection against light damage depends on a long-range state of cell adaptation to light itself. The normal diurnal cycle of light and dark seems to be the essential factor in controlling visual cell viability and susceptibility. (Author)

A71-24339 # **Effect of hypodynamia on hemodynamics under various climatic conditions (Vliianie gipodinamii na gemodinamiku v razlichnykh klimaticheskikh usloviiakh).** P. O. Viazitskii and S. D. Kumanichkin. *Voenno-Meditsinskii Zhurnal,* Jan. 1971, p. 48-50. In Russian.

Study of the effect of a six-day period of hypodynamia on the hemodynamics of three groups of young healthy men under comfortable, hot and humid, and cold microclimatic conditions, respectively. It is shown that hemodynamic shifts under conditions of hypodynamia depend primarily on microclimatic factors, an important role in this case being played by changes in the level of hormonal activity of the sympathoadrenal system. A.B.K.

A71-24340 # ***Changes in the functional state of the auditory analysor as a function of the flight duration and the task performed (Izmenenie funktsional'nogo sostoianiia slukhovogo analizatora v zavisimosti ot prodolzhitel'nosti poleta i vypolniaemogo zadaniia).*** K. L. Khilov, A. E. Kurashvili, O. F. Zakharova, and Iu. K. Revskoi. *Voenno-Meditsinskii Zhurnal,* Jan. 1971, p. 58-61. In Russian.

Study of the effect of prolonged flights and flights connected with emotional stress on the visual analysor of flight crew members. On the basis of analyses of hearing acuity, air and bone conduction thresholds, and reverse adaptation time, it is established that functional changes in the auditory analysor caused by strong emotional stress during short flights are unstable and after a day's rest are almost completely eliminated. After long flights, however, when an accumulation of numerous harmful factors occurs, the hearing restoration occurs more slowly, so that longer rest periods are urged for crews after such flights. A.B.K.

A71-24341 # **Hemodynamic shifts in pilots during flight on a trainer (Gemodinamicheskie sdvigi u letchikov vo vremia poleta na trenazhere).** Ia. S. Leshchinskaia, I. G. Pasternak, and S. U. Balalov. *Voenno-Meditsinskii Zhurnal,* Jan. 1971, p. 63-67. In Russian.

Study of the functional state of the cardiovascular system of pilots on the AN-24 trainer. Three main types of reaction of the cardiovascular system during training flights are noted - a depressed reaction, where the increase in the cardiac contraction rate is less than normal even under emergency conditions; a moderate reaction, where the increase is about normal for the given conditions; and an enhanced reaction, where the increase is above-normal. A distinct parallelism is noted between the type of reaction and the flight capabilities of the pilot. Case histories illustrating these three types of reaction are presented. A.B.K.

A71-24440 # **Specific characteristics of cortical potentials evoked by weak acoustic signals in man (Osobennosti vyzvannykh potentsialov kory na slabye zvukovye stimuly u cheloveka).** E. A. Kostandov, G. I. D'iachkova, and L. V. Timofeeva (Tsentral'nyi Nauchno-Issledovatel'skii Institut Sudebnoi Psikhiatrii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 196, Jan. 11, 1971, p. 471-474. 15 refs. In Russian.

Five to fifteen microsec white noise signals were delivered through microphones into the right ear in a group of 12 male subjects with normal hearing. The subjects were confined in a soundproof chamber and were instructed to make silent signal counts and then repeat the results orally after each series of stimuli. Active electrodes were applied to the inion area of the subjects and indifferent electrodes were applied to their left ear lobes. Averaged evoked potentials produced by stimuli were recorded in the form of a low-amplitude positive electromagnetic wave with a long latent period and a long oscillation period. Evoked cortical potentials could be recorded when the acoustic stimuli were too weak for perception by hearing. V.Z.

A71-24442 # **Effect of temperature on the behavior of the b-wave in the electroretinogram of dark-adapted frogs during a series of light exposures (Der Einfluss der Temperatur auf das Verhalten der b-Welle im Elektroretinogramm dunkeladaptierter Frösche bei Serienbelichtung).** H. Berger and H. Werner (Jena, Universität, Jena, East Germany). *Acta Biologica et Medica Germanica,* vol. 25, no. 5-6, 1970, p. 837-845. 12 refs. In German.

Experiments were carried out on frogs subjected to a serial flash stimulation at 4 and 12 C. The results show that the steep slope of the b-wave can be reduced by cooling the animals, the effect being due to the increase in the peak time and the reduction of the amplitude. The time constant of the decline of the b-wave increases. The increase in the potential is more strongly inhibited than the decrease. In the undercooled animals the b-wave failed to come to a steady state during the early phase of stimulation. The amplitudes declined very rapidly in the beginning, remained then almost constant, and finally reincreased in a linear fashion. The changes in amplitude are described by functions of the logarithm of the intensity of stimulation and exponential functions of the interval of stimulation. O.H.

A71-24443 # **The influence of intensive dazzling stimuli on the electroretinogram of monochromatic flickering light in man (Der Einfluss intensiver Blendreize auf das Elektroretinogramm monochromatischen Flimmerlichtes beim Menschen).** R. Hasenöhrl and H. Berger (Jena, Universität, Jena, East Germany). *Acta Biologica et Medica Germanica,* vol. 25, no. 5-6, 1970, p. 847-854. 21 refs. In German.

Experimental results indicate that intensive dazzling stimuli produce a strong postexcitatoric inhibition which transiently suppresses the flickering activity of the retina to a degree that the flickering potentials become drowned in the noise background of the preamplifier. After completion of the nonflickering part, the amplitudes of the flickering potentials reincrease rapidly and approach a temporary saturation value. The difference between this value and the electrical flickering amplitudes prior to dazzling results from the bleaching action of the dazzling light. The increase in flickering potentials was translated into an empirical formula which suggests that the dazzled retina behaves like an externally energized oscillator which has been attenuated for a short period of time. O.H.

A71-24444 # **A simple low-drift dc voltage amplifier for biological studies (Ein einfacher driftarmer Transistor-Gleichspannungsverstärker für biologische Untersuchungen).** G. Zeschke (Deutsche Akademie der Wissenschaften, Institut für kortiko-viszerale Pathologie und Therapie, Berlin, East Germany). *Acta Biologica et Medica Germanica,* vol. 25, no. 5-6, 1970, p. 915-926. 46 refs. In German.

A new type of a low-cost amplifier with thermodynamic drift stabilization is described. Using a simple directly coupled differential amplifier without compensation circuits, it is shown that changes in ambient temperature from 27 to 19 C do not affect the drift behavior and that the drift of the amplifier is very small. Long-term studies over 140 hours have yielded an average current drift of approximately 120 microvolts/hr and a voltage drift of 8.2 microvolts/hr. O.H.

A71-24466 Conditioned motor reflexes in cats with damage to the globus pallidus. L. S. Gambarian, A. A. Garibian, J. S. Sarkisian, and V. O. Ganadian (Armenian Academy of Sciences, Laboratory of Neurobionics, Yerevan, Armenian SSR). *Experimental Brain Research,* vol. 12, no. 1, 1971, p. 92-104. 20 refs.

Experimental investigation of the role and specific significance of the globus pallidus, carried out in adult cats. It was found that unilateral destruction of globus pallidus does not influence natural conditioned reflexes. Bilateral destruction results in temporary disappearance of natural and artificial conditioned motor reflexes. Further training is necessary for the reestablishment of these reflexes; however, the training period is twice that required in the preoperative period. After partial bilateral destruction of the

pallidum, animals that have been trained to make a choice between a right or a left feeding tray lose this ability. After the reestablishment of conditioned reflexes, the animals make a correct choice only 50 - 70% of the time. After total bilateral destruction, the animals lose artificial conditioned reflexes; there are not reestablished even after four months of training, though natural conditioned reflexes can be established but with difficulty. The results suggest that globus pallidus has a close relationship with the mechanisms of learning and memory. O.H.

A71-24475 * EEG electrode-amplifier harness. J. Hanley, W. R. Adey, J. R. Zweizig, and R. T. Kado (California, University, Los Angeles, Calif.). *Electroencephalography and Clinical Neurophysiology*, vol. 30, Feb. 1971, p. 147-150. 12 refs. Contracts No. NAS 9-7282; No. AF 49(638)-1387.

The harness was designed for monitoring the EEG of astronauts in awake and sleep states during space missions. It is compatible with cable and radiotelemetry and allows acquisition of physiological data from physically active subjects on a noninterference basis. EEG, EOG, EMG, and blood-pressure sensors are incorporated into the headgear. The harness is essentially a bathing-cap type helmet with snap-in sponge Ag/AgCl electrodes. G.R.

A71-24484 # 'Split' motor unit potentials in humans ('Rasshchepliaiushchiesia' potentsialy dvigatel'nykh edinits u cheloveka). L. P. Kudina and R. S. Person (Akademiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 57, Jan. 1971, p. 38-44. 11 refs. In Russian.

Analysis of motor unit potentials of the rectus femoris muscle recorded with the aid of a needle electrode under conditions of prolonged isometric contraction with a force ranging from 17 to 35% of the maximum. Eleven motor units out of 200 investigated were found to have a regularly varying potential configuration, with two alternating forms being observed, one of which had one or several oscillations less than the other or a smaller amplitude. The occurrence of these 'split' potentials is attributed to blocking of certain muscle fibers of which the motor units are composed, due to polyneuronal innervation or other factors, or to the fact that a potential usually considered as the discharge of a single motor unit may be the result of synchronized discharges of two motor units. A.B.K.

A71-24485 # Generation of the control signal in the thermoregulation system of an organism (O vyrabotke upravliaiushchego signala v sisteme termoreguliatsii organizma). K. P. Ivanov and N. A. Slepchuk (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 57, Jan. 1971, p. 103-110. 14 refs. In Russian.

Determination of the mechanisms of incorporation of vasodilation reactions into the response to an adequate rise in the external temperature by precision measurement of the temperature at various points in the body of the unanesthetized rabbit. On the basis of a mathematical treatment of the thermometry data it is shown that the generation of an appropriate stimulus (a control signal) is a function of temperature shifts at various points in the body. The generation of a control signal is determined by fairly complex relations between the temperature shifts in the peripheral and central regions of the organism. A.B.K.

A71-24486 # Physiological mechanisms of chemical thermoregulation after adaptation to cold (O fiziologicheskikh mekhanizmakh khimicheskoi termoreguliatsii posle adaptatsii k kholodu). E. Ia. Tkachenko (Akademiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR) and K. P. Ivanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 57, Jan. 1971, p. 111-115. 21 refs. In Russian.

Analysis of the residual electrical activity observed in white rats and rabbits during chemical thermoregulation after prolonged cold adaptation. This electrical activity is determined both in intact animals and in individual groups of muscles in situ. It is shown that after cold adaptation the energetics of muscle contractions in white rats and rabbits during shivering and thermoregulation tonus change. In comparison with control animals, the oxygen consumption by muscles per unit of muscle electrical activity (in integrator pulses per minute) increases severalfold in cold-adapted animals. A.B.K.

A71-24487 # A miniaturized single-channel radio-telemetric transmitter for recording EKGs of animals and humans (Miniatiurnyi odnokanal'nyi radiotelemetricheskii peredatchik dlia registratsii EKG u zhivotnykh i cheloveka). S. Kh. Tatoian (Akademiia Meditsinskikh Nauk SSSR, Sukhumi, Georgian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 57, Jan. 1971, p. 130-132. In Russian.

Description of a miniaturized telemetric arrangement designed for recording EKGs of monkeys. The transmitting device in this arrangement consists of a two-state amplifier, a modulator, and a transmitter. The entire transmitting device including the power supply unit does not weigh more than 55 g. One power supply unit is sufficient for eight hours of continuous operation of the transmitting device. A.B.K.

A71-24602 Tendencies to eye movement, and misperception of curvature, direction, and length. Veijo Virsu (Helsinki, University, Helsinki, Finland). *Perception and Psychophysics*, vol. 9, no. 1B, Jan. 1971, p. 65-72. 27 refs.

Investigation in two experiments of the possible influence on perception of the following types of eye-movement tendencies: tendency to rectilinear eye movements, tendency to horizontal or vertical eye movements, and tendency to center-of-gravity fixations. In the first experiment, errors in perceived location of intersection in arc figures were studied varying arc-point distance and arc length. Tendencies 1 and 2 accounted very well for the resultant S-shaped functions. In the second experiment, the Müller-Lyer illusion with three different oblique angles and a line-segment illusion were measured as a function of the distance between the vertex and the center of gravity of the arrowhead. Tendency 3 accounted well for the inverted-U forms of the obtained functions but not for the increase of error with increasing angle. M.M.

A71-24603 Visual movement perception - A comparison of absolute and relative movement discrimination. R. A. Kinchla (Princeton University, Princeton, N.J.). *Perception and Psychophysics*, vol. 9, no. 2A, Feb. 1971, p. 165-171. 5 refs.

Suggestion that there are two types of visual movement perception, absolute and relative. The former occurs when an object is seen to move in an otherwise homogeneous (or at least locally homogeneous) visual field. Relative judgments occur when one object is seen to move with respect to another - i.e., the separation between them is seen to change. Quantitative models for both processes are developed, and an experiment is reported for which the models seem appropriate. The results appear relevant to a theory of size of length perception, as well as to the general perceptual issue of absolute and relative judgments. (Author)

A71-24605 * Comparison of cupulometric and psychophysical thresholds for perception of rotation and the oculogyral illusion. Steven L. Dockstader (San Jose State College, San Jose, Calif.). *Perception and Psychophysics*, vol. 9, no. 3A, Mar. 1971, p. 299-302. 16 refs. Grant No. NGL-05-046-002.

The purpose of this study was to compare thresholds for angular acceleration derived by subjective cupulometry and by a staircase method. Thresholds for the perception of rotation and the oculogyral illusion were determined for 10 Os who were rotated abou

their vertical axis. The cupulometric thresholds were significantly higher, more variable, and not predictable from the staircase thresholds. Furthermore, cupulometry failed to distinguish between the thresholds for the perception of rotation and the oculogyral illusion, although both indicators functioned according to the prediction of the underlying linear model. Individual differences supported the general conclusion that cupulometric thresholds bear no relationship to the sensory threshold derived in a classical psychophysical manner. (Author)

A71-24606 Properties of changing patterns evoking visually perceived oscillation. Erik Börjesson (Uppsala, Universitet, Uppsala, Sweden). *Perception and Psychophysics,* vol. 9, no. 3A, Mar. 1971, p. 303-308. 18 refs. Research supported by the Swedish Council for Social Science Research and the Tricentennial Fund of Bank of Sweden.

The aim of this study was to identify some properties of changing proximal stimulus patterns which favor perceived oscillation. By using artificially generated stimulus patterns, it was found that the amount of changes associated with a certain direction of rotation should be small and the rate of these changes low if perceived oscillation was to appear. Great or swift changes were utilized by the visual system to determine perceived direction of rotation, and oscillation was not then reported. It was further found that patterns lacking straight edges perpendicular to the axis of rotation, or with this axis displaced from the middle of the pattern, and patterns with a gradient of texture density were perceived to oscillate more than similar patterns without these properties. Perceived oscillation of ellipses was discussed, and it was concluded that perceived oscillation was a consequence of perceived orientation, which is determined by stimulus properties. (Author)

A71-24607 * Duration discrimination of brief light flashes. Lorraine G. Allan, A. B. Kristofferson, and E. W. Wiens (McMaster University, Hamilton, Ontario, Canada). *Perception and Psychophysics,* vol. 9, no. 3B, Mar. 1971, p. 327-334. 13 refs. National Research Council of Canada Grants No. APA-0112; No. APA-0175; Grant No. NGR-52-059-001.

Data from four experiments indicate that when observers discriminate between light flashes of different durations, for durations for which Bloch's law has been shown to hold, their discriminations are frequently made on the temporal information available in the flashes rather than on their apparent brightness. A model for duration discrimination which specifies that discriminability depends only on the difference in duration between the two brief flashes, and is independent of their durations, is presented and applied to the data. M.M.

A71-24608 Visual resolution in the periphery. Joyce L. Kerr (Columbia University, New York, N.Y.). *Perception and Psychophysics,* vol. 9, no. 3B, Mar. 1971, p. 375-378. 21 refs. Research supported by Columbia University; Contract No. Nonr-266(46).

Determination of visual acuity thresholds for two objects with a 3-deg square grating target presented for 0.2 sec within a steadily illuminated surround field matched in luminance to the test field. Measurements were made in the fovea, and at 10, 20, and 30 deg along the horizontal meridian of the temporal retina, at luminances between -3.5 and 3.0 log mL. The foveal acuity-luminance functions showed a large increase in acuity up to 1 or 2 log mL, but at peripheral locations very little increase occurred above 0 log mL. The maximum acuity reached at photopic luminances dropped sharply with increasing eccentricity. Visual acuities were two to four times higher than those previously reported for the periphery; methodological and target differences are presented to account for this result. (Author)

A71-24610 Biological evaluation of various spacecraft cabin atmospheres. II. R. W. Hamilton, Jr., G. F. Doebbler, and H. R. Schreiner (Ocean Systems, Inc., Tarrytown, N.Y.). *Space Life Sciences,* vol. 2, Mar. 1971, p. 407-436. 92 refs.

Results of experiments with rats to compare nitrogen, helium, argon, and neon with respect to altitude decompression, and to provide an interspecies comparison of some of the metabolic effects of these gases. It appears that the metabolic acceleration in a helium atmosphere is due primarily to its thermal properties. Oxygen consumption is slightly reduced on exposure to a low pressure, pure oxygen atmosphere that provides a normal alveolar oxygen tension. A neon-oxygen atmosphere shows no immediately obvious biological hazard for exposures up to one week, and along with helium, this gas appears to offer some protective advantage in altitude decompression. F.R.L.

A71-24611 * Plans for orbital study of rat biorhythms - Results of interest beyond the biosatellite program. Franz Halberg, Walter Nelson, Walter J. Runge, Otto H. Schmitt (Minnesota, University, Minneapolis, Minn.), Grover C. Pitts (Virginia, University, Charlottesville, Va.), John Tremor (NASA, Ames Research Center, Moffett Field, Calif.), and Orr E. Reynolds. *Space Life Sciences,* vol. 2, Mar. 1971, p. 437-471. 36 refs. PHS Grants No. 5-K6-6M-13; No. 5-K6-GM-191; Contracts No. NAS 2-2738; No. NAS 2-1554; Grant No. NGR-24-005-006.

Discussion of a program set up to determine whether characteristics of physiologic rhythms in mammals (8 rats, for a 21-day period) are measurably influenced by exposure to zero gravity. Although the program could not be completed, the preparations are summarized with a view to the planning of similar missions in the future, or for the study of other rhythmometry involving applied or basic problems on the earth as well as in aerospace. F.R.L.

A71-24612 Review of organic matter in the Orgueil meteorite. Bruce L. Baker (Calgary, University, Calgary, Alberta, Canada). *Space Life Sciences,* vol. 2, Mar. 1971, p. 472-497. 263 refs. Research supported by the National Research Council of Canada.

The Orgueil meteorite is a carbonaceous chondrite containing 3.1% carbon, 5.5% sulfur and 19.9% water. Virtually all of the carbon is present as organic carbon although only about 20% is soluble in common organic solvents; the remainder is in the form of a highly substituted, irregular and aromatic polymer. Detailed methods of analysis have been improved in the past ten years sufficiently for the detection of individual compounds in most of the following classes of organic compounds: hydrocarbons, oxygen-, sulfur- and nitrogen-containing organic compounds, optically active species, isotopes, bacteria and organized elements. Ten series of homologous compounds have been observed in the aliphatic hydrocarbons. In the 1950's, when interest was renewed in the Orgueil meteorite, the analytical capabilities may have given a bias toward biogenic agencies for the formation of the organic matter found in the meteorites. M.M.

A71-24613 A kinetic analysis of spore inactivation in a composite heat and gamma radiation environment. V. L. Dugan (Sandia Laboratories, Albuquerque, N. Mex.). *Space Life Sciences,* vol. 2, Mar. 1971, p. 498-505. 5 refs.

This paper presents the analysis of a combined environment of dry heat and gamma radiation when applied for the purpose of spacecraft sterilization. The nature of the synergistic inactivation effect of dry heat and radiation on bacterial spores is explained using a semiempirical mathematical model, and the dependence of the inactivation rate upon a temperature dependent, nonlinear function of radiation dose rate is presented. An analysis of the temperature required for a defined population reduction with a defined upper

limit on radiation dose and time is described. Also discussed is the dependency of the dose required for a defined population reduction on the radiation dose rate at any selected temperature. (Author)

A71-24614 # **Steady flow in the region of closed streamlines in a cylindrical cavity.** J. L. Duda and J. S. Vrentas (Dow Chemical Co., Midland, Mich.). *Journal of Fluid Mechanics*, vol. 45, Jan 30, 1971, p. 247-260. 25 refs.

An analytical solution is developed to describe the steady, closed streamline velocity field within a cylindrical cavity with a uniformly translating wall at low Reynolds numbers. The solution has application for the case of two-phase flow in a tube where regions of fluid are segmented by a moving train of bubbles or plugs, such as in the pulmonary and peripheral capillaries of the body where segments of plasma are trapped between red blood cells. The mathematical approach presented in this study can in principle be useful in the analysis of a wide class of closed-streamline creeping-flow problems. (Author)

A71-24625 # **Flow and pressure drop in systems of repeatedly branching tubes.** T. J. Pedley, R. C. Schroter, and M. F. Sudlow (Imperial College of Science and Technology, London, England). *Journal of Fluid Mechanics*, vol. 46, Mar. 29, 1971, p. 365-383. 19 refs. Research supported by the Royal Society, the Asthma Research Council, and the Tobacco Research Council.

Experiments have been carried out in models containing up to two generations of symmetrical junctions with fixed branching angle and diameter ratio, typical of the human lung. Flow visualization studies and velocity measurements in the daughter tubes of the first junction verified that secondary motions are set up, with peak axial velocities just outside the boundary layer on the inner wall of the junction, and that they decay slowly downstream. Axial velocity profiles were measured downstream of all junctions at a range of Reynolds numbers for which the flow was laminar. In each case these velocity profiles were used to estimate the viscous dissipation in the daughter tubes, so that the mean pressure drop associated with each junction and its daughter tubes could be inferred. G.R.

A71-24654 # **The seasonal influence on the daily periodicity of radiosensitivity of mice (Der Einfluss der Jahreszeit auf die Tagesperiodizität der Strahlenempfindlichkeit von Mäusen).** S. S. Kuznetsova. *Radiobiologia - Radiotherapia*, vol. 11, no. 5, 1970, p. 611-619. 26 refs. In German. (Translation).

Experimental results indicate that in summer, the daily periodicity of radiosensitivity of mice is two-phase, whereas in winter it is one-phase. It is suggested that these differences are produced by changes in the proportion of the bright and dark daytime in the course of the year. The factor of feeding also plays an important part in the formation of the rhythm of radiosensitivity. O.H.

A71-24674 **Recent studies on cardiac hypertrophy.** Barry L. Fanburg (New England Medical Center Hospitals; Tufts University, Boston, Mass.). *American Heart Journal*, vol. 81, Apr. 1971, p. 447-450. 27 refs. NIH Grants No. 5T01 HE-06924; No. 3T01 HE-05391.

Brief review and commentary of information currently available on experimental cardiac hypertrophy in the laboratory animal. It is noted that it appears that the development of hypertrophy is a method of temporary compensation for an increased cardiac work load. It is quite possible that any increase in work load, regardless of its duration, sets in motion a sequence of biochemical alterations of the muscle cell. Whether the initial transmission of a mechanical to a biochemical change occurs at the cell membrane or in the interior of the cell is, at the moment, unknown. M.M.

A71-24678 **Influence of the mediastinum on the measurement of esophageal pressure and lung compliance in man.** K. P. van de Woestijne, D. Trop, and J. Clément (Akademisch Ziekenhuis St. Rafaël, Leuven, Belgium). *Pflügers Archiv*, vol. 323, no. 4, 1971, p. 323-341. 22 refs. Research supported by the High Authority of the European Community for Coal and Steel.

The variations of the esophageal elastance and the amplitude of the cardiac oscillations have been used as a criterion for the presence and as a measure of a local mediastinal effect. The latter is investigated at various lung volumes and levels in the esophagus, at two body positions and with two different esophageal balloons. The effect of extrapolating pressure to zero balloon volume is also evaluated. O.H.

A71-24679 **Heart rate and extravascular components of coronary resistance (Herzfrequenz und extravasale Komponente des Coronarwiderstandes).** W. K. Raff, F. Kosche, and W. Lochner (Düsseldorf, Universität, Düsseldorf, West Germany). *Pflügers Archiv*, vol. 323, no. 3, 1971, p. 241-249. 9 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

When stimulating the heart artificially by way of the right auricle after elimination of the sinus node, systolic and diastolic times are normal in the studied range of 60 to 220 beats per minute. When the intravascular component of coronary resistance is kept constant by way of a pharmacological maximal dilatation, an increase of extravascular resistance can be observed in all experiments with increased heart rate. This increase is caused by the relative increase of systolic time and the decrease of diastolic time. The increase of resistance is relatively small, because the decrease of systolic inflow resistance counterbalances the effect of lengthening of systole. The extravascular component of diastolic inflow resistance is independent of heart rate. O.H.

A71-24680 **Influence on cortical responses to patterned flashes of contrast-depth and of the ratio between the combined light and dark areas.** W. J. Rietveld and J. R. B. Hagenouw (Leiden, Rijksuniversiteit, Leiden, Netherlands). *Pflügers Archiv*, vol. 322, no. 3, 1971, p. 235-249. 13 refs. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek.

Experiments are described in which healthy dark-adapted subjects were exposed to flashes of 4 microsec duration and luminance of 3 mL, presented at a frequency of 2/sec. Responses were averaged over 100 flashes. It is found that changes in contrast depth at constant flash intensity and at constant overall flux result in a sigmoid-shaped relation between the latency of the main negative component and the contrast depth. An increase in total flux results in a steeper, sigmoid, relation. The latency vs contrast depth is independent of the spatial frequency of the pattern. An increase of the dark to light ratio up to 50/50 results in a linear decrease of the latency of the negative component. The shape of the latency vs contrast depth function is dependent on the dark to light ratio, up to a ratio of 50/50, and independent at higher ratios. O.H.

A71-24681 **Frequency inotropism and Frank-Starling mechanism in canine heart in situ during natural and artificial heart pacing (Frequenzinotropie und Frank-Starling-Mechanismus am Hundeherzen in situ unter natürlichem und künstlichem Herzantrieb).** P. Limbourg, W. Wende, H. Henrich, and U. Peiper (Würzburg, Universität, Würzburg, West Germany). *Pflügers Archiv*, vol. 322, no. 3, 1971, p. 250-263. 32 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Study of the effect of changes in the heart rate between 40 and 130/min on cardiac dynamics in anesthetized dogs with closed chest. At stabilized aortic mean pressure and variation of sinus node rhythm by graduated stimulation of the right vagus nerve a negative exponential function was found between heart rate and enddiastolic pressure. The likewise negative but linear regressions between heart rate and enddiastolic volume, or stroke volume, or ejection time,

respectively, were almost equal as far as the relative values are concerned. Ejection fraction and mean rate of ejection ranged independently of the heart rate almost constantly. Therefore, the ventricular volumes were primarily determined by the Frank-Starling mechanism, whereas frequency potentiation caused a positive linear regression between the heart rate and the amplitude of the first differential quotient of the left ventricular pressure. When increasing the heart rate by right ventricular pacing at a stabilized aortic pressure, the results were the same in principle, but there was a distinct depressive effect of ventricular pacing at higher heart rates. O.H.

A71-24688 Terrestrial organisms survive in simulated Jupiter atmosphere (Irdische Organismen überleben in simulierter Jupiteratmosphäre). Egmont Koch. *Sterne und Weltraum,* vol. 10, Mar. 1971, p. 72-74. 14 refs. In German.

It is pointed out that the present reducing atmosphere of the giant planets is very similar to the terrestrial atmosphere at the time of the origin of life on earth. Bacteria which use methane as a source for carbon are discussed, and the chemical reactions involved are examined. Investigations regarding an adaptation of various microorganisms to a methane-ammonia-hydrogen atmosphere are considered including tests in which plants such as the Euphorbia xylophyloides, Euphorbia hermentiana, and Euphorbia cladestina were kept for two months in such an atmosphere. It was found that many microorganisms at the plants had survived the imposed conditions and had even multiplied. Studies with a one-celled alga and with the aquatic plant Elodea are also discussed. G.R.

A71-24754 # Utilization of space research results in medicine (Wykorzystanie technicznych osiagnieć astronautyki w medycynie). Zbigniew Jethon. *Technika Lotnicza i Astronautyczna,* vol. 26, Jan. 1971, p. 3-6. 5 refs. In Polish.

Telemetry techniques and new types of sensor electrodes developed in aerospace research have been applied to medical monitoring purposes under clinical and natural conditions. Remote measurements provide blood pressure records, while seismocardiography is used to determine heart damage. Monitors have been developed for visual analysis of the patient's state of health, and computers are used for data processing and for filtering noise from X-ray plates. New sterilization procedures originated from aerospace developments, and numerous devices and equipment have been invented for use by the physically handicapped. T.M.

A71-24760 Self-organization of a man-machine coupling - A cybernetic behavior principle (Sur l'auto-organisation du couplage homme-machine - Un principe de comportement cybernétique). G. Jumarie (Engins Matra, S.A., Vélizy, Yvelines, France). *L'Onde Electrique,* vol. 51, Jan. 1971, p. 49-56. 18 refs. In French.

Investigation of some of the influence sources that affect the self-organization of man-machine systems. A functional diagram representative of a human pilot viewed as a self-organized system is reduced to a simplified model of a human pilot and then stripped to a bare schematization of the man-machine coupling principle. Analyses of the various human functions make it possible to build up an equivalent operating mechanism generating quantified information. It is shown how a few human-response models lead to general conclusions in regard to both system synthesis and pilot training. In conclusion, the cybernetic behavior principle is formulated. M.V.E.

A71-24807 * The retinal threshold gradient in the presence of a high-luminance target and in total darkness. Richard F. Haines (NASA, Ames Research Center, Moffett Field, Calif.). *Perception and Psychophysics,* vol. 9, no. 2B, Feb. 1971, p. 197-202. 39 refs.

The retinal threshold was measured along the horizontal meridian for the dark-adapted eye and for the same retinal region light-adapted by stray light from a small foveally fixated high-luminance target. Two target luminances were investigated. The angular distance between the fovea and the intersection of the steep component with the shallow component of each threshold curve tended to shift toward the target's edge with an increase in target luminance. These data are interpreted as an indication that a dynamic neural mechanism is involved in producing the irradiation phenomenon. M.M.

A71-24808 Instruction effects on watch keeping in a 'simple' vigilance task. Philip Tolin (Central Washington State College, Ellensburg, Wash.). *Perception and Psychophysics,* vol. 9, no. 2B, Feb. 1971, p. 227, 228. 9 refs.

Two experiments were conducted to determine the effect of variation in pretask instructions on performance on a simple vigilance task. In both experiments one group was told that the task would be challenging (Group C) and the other group, that the task would be monotonous (Group M). In Experiment 1 time-related decrements were found in the percentage of correct signal detections and in the number of incorrect responses. The results of Experiment 2 indicated time-related decrements, but no group differences, in percentage of correct detections. Group M also made progressively fewer false alarms, while false-alarm rates for Group C did not change over time. Differences in mechanisms underlying performance decrements are discussed. (Author)

A71-24825 Human factors in operating systems related to delay and displacement of retinal feedback. Vernon Putz and Karl U. Smith (Wisconsin, University, Madison, Wis.). *Journal of Applied Psychology,* vol. 55, Feb. 1971, p. 9-21. 12 refs. Research supported by the Social and Rehabilitation Administration and NSF.

Experimental assessment of the validity of the theories of adaptation to displaced and delayed retinal feedback in behavior relative to the human factors problems of design of machines and tools, and of optometric diagnostic and visual training and rehabilitation devices. The findings support a behavioral cybernetic interpretation of the guidance factors in man-machine and perceptual systems relationships by showing that the effects of altered feedback in machine and systems operation are determined by movement capabilities in compensating displacements and delays in sensory input. They also suggest that visual impairments may be produced by delays in the retinal feedback effects of eye and head movements, and that these defects may require dynamic methods of optometric diagnosis and training for their measurement and correction. F.R.L.

A71-24860 * # Human perception of angular acceleration and implications in motion simulation. J. D. Stewart (NASA, Ames Research Center, Man-Machine Integration Branch, Moffett Field, Calif.). *(American Institute of Aeronautics and Astronautics, Visual and Motion Simulation Technology Conference, Cape Canaveral, Fla., Mar. 16-18, 1970, Paper 70-350.) Journal of Aircraft,* vol. 8, Apr. 1971, p. 248-253. 26 refs.

Data on human subjective response to angular acceleration collected on the Ames Man-Carrying Rotation Device are presented and the implications of these data to motion simulation are discussed. Threshold data have been obtained for several stimulus durations, three axes of rotation, and two response indicators. These thresholds indicate that the average pilot can be very sensitive to angular acceleration. First-order approximations to the human dynamic response to angular accelerations are derived from four experiments and resulting time constants vary from 4 to 10 sec depending on the observer's task. It is demonstrated that a simple static washout concept requiring continuous rotations at subthreshold levels provides essentially useless reductions in simulator travel. Another washout scheme based on the dynamics of the vestibular system is considered. The variation in the apparent dynamics derived from the psychophysical data suggest that

simulator washout characteristics may have to be tailored to each simulated flight configuration or piloting task. (Author)

A71-24955 **Modelling biological systems.** F. R. Janes and E. R. Carson. *Electronics and Power,* vol. 17, Mar. 1971, p. 110-116. 10 refs.

A simplified picture of the organization of the human body is presented. The brain is the overall organizer which filters the incoming information, compares incoming sensory patterns against stored patterns, makes decisions and controls nervous outputs. A model of the cardiovascular system is discussed. The model attempts to explain the way in which variables are controlled to regulate the blood pressures and flows throughout the system. A block diagram of circuit equations of the cardiovascular system is provided, and a feedback model for arteriolar muscle contraction is considered. A functional model of protein metabolism is described. G.R.

A71-24976 # **Speed of propagation of the rheographic wave to the lower limbs in normal subjects, in subjects afflicted with obliterating arteriopathy, and in subjects with peripheral arterial sclerosis (Sulla velocità di propagazione dell'onda reografica agli arti inferiori in soggetti normali, in soggetti con arteriopatia obliterante ed in soggetti con sclerosi arteriosa periferica).** L. Di Renzi, V. Lucisano, F. Leggio, G. Gambelli, and R. Cassone. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 307-329. 85 refs. In Italian.

A total of 178 subjects of both sexes were investigated. In the group of normal subjects the speed of the rheographic wave showed a clear tendency to increase with age. The data collected in the two groups of subjects with obliterating arteriopathy and with non-obstructive peripheral arterial sclerosis are significant. In the former group the speed of the rheographic pulse was found to be definitely lower than that of normal subjects of the same age. In the latter group the speed was found to be particularly high reaching the highest values observed in all the cases investigated. The findings are considered to be of semeiological and clinical interest in the exploration of the peripheral arterial circle. M.M.

A71-24977 # **Recent knowledge about the effects of flight on the urinary tract (Recenti conoscenze circa gli effetti del volo sull'apparato urinario).** L. La Marca. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 330-368. 57 refs. In Italian.

Study of the manner in which flight is a concomitant pathogenetic cause of the most common urinary tract conditions. It was found that the urinary tract is sensitive to the accelerations occurring during flight. The kidney, due to its inefficient system of containment, descends during the application of positive accelerations, resulting in a state of renal suffering generally manifested through proteinuria. There is the possibility, as a result of stasis in the urinary tract, of the onset of inflammatory episodes and calculosis. Other environmental flight conditions, such as excessive cockpit temperature, prolonged immobility, and postponed urination, may cause diuretic changes and therefore urinary conditions. M.M.

A71-24978 # **Observations on the behavior of central vision in some simulated flight situations (Osservazioni sul comportamento della visione centrale in talune situazioni simulate di volo).** G. Meinert and V. Sorano. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July Sept. 1970, p. 369-382. In Italian.

Study of the influence of positive and latero-lateral accelerations and acute hypoxic hypoxia on the behavior of central visión. Special equipment was made for exploring the visual field of subjects. Luminous geometric symbols on a black background variously spaced from the center of fixation were presented in different sequences. The determination of the number of symbols recognized according to three diameters made it possible to reconstruct graphically the size of the field within which the symbols were correctly recognized. The results showed that: the narrowing of the field is almost nil with positive accelerations, is greater with lateral accelerations, and quite obvious under conditions of hypoxia; and in the case of accelerations there is a shifting of the entire field in the direction of the inertial vector. This can be traced to reflex vestibulo-ocular mechanisms. M.M.

A71-24979 # **Effect of neurohomologous phospholipids associated with other substances on experimental poisoning from asymmetrical dimethylhydrazine. I - Cortical phospholipids and pyridoxine (Effetto dei fosfolipidi neuroomologhi associati ad altre sostanze sull'intossicazione sperimentale da dimetilidrazina asimmetrica. I - Fosfolipidi corticali e piridossina).** G. Maniero, G. Toffano, and P. Vecchia. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 383-392. 24 refs. In Italian.

Study in mice of the protective effect against asymmetrical dimethylhydrazine (UDMH) poisoning of vitamin B6 given alone and in association with cortical phospholipids. The usefulness of this association is shown, and the possible mechanisms of interaction are discussed. F.R.L.

A71-24980 # **Supersonic flight in a TF-104G aircraft - Personal experiences of a flight surgeon (Volo supersonico su velivolo TF-104G - Esperienze personali di un medico aeronautico).** G. Rotondo. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 393-414. 9 refs. In Italian.

Description of the subjective sensations and the phenomena observed during the various phases of supersonic flight, giving the relative physical and physiopathogenetic interpretation. The absence of other particular sensations due to the effects of anoxia, aeroembolism, and positive centrifugal accelerations is pointed out. This absence is attributed to the efficiency of the protective system on board, and to the particular methods and procedures of flight at very high speed. The particular usefulness of this direct study of the physiopathological effects of modern flight by the flight surgeon for better collaboration between surgeon and pilot as a means of increasing safety is considered to have been demonstrated. F.R.L.

A71-24981 # **Problem of the psychological selection of pupil pilots - First results of the application of the Zulliger collective test on a group of pupil pilots (Sul problema della selezione psicologica degli allievi piloti - Primi risultati relativi all'applicazione del test di Zulliger collettivo su un gruppo di allievi piloti).** F. Sparvieri. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 415-429. 7 refs. In Italian.

Attempt to find correlations in a group of pupil pilots between the values of single parameters of the Zulliger test and instructional data. The values of two parameters were found to correlate with the latter in a statistically significant way. It is therefore deduced that the high level of the interior tendency to struggle, and the low level of the intelligence complex are directly related in the sample studied to flying aptitude. F.R.L.

A71-24982 # **The flying accident and its sociopsychiatric role as a psychoreactive group factor (L'incidente di volo ed il suo ruolo socio-psichiatrico quale fattore psico-reattivo di gruppo).** L. Longo. *Rivista di Medicina Aeronautica e Spaziale,* vol. 33, July-Sept. 1970, p. 430-440. In Italian.

Study of the psychoreactive action caused by a flying accident in the group and of the different repercussions in the fields of civil and military aviation. Emphasis is placed on the elements which characterize these differences, and attention is drawn to the sociopsychiatric role that the accident, especially if serious or fatal, has in the case of military aviation particularly, owing to the community aspects involved. The phenomenological modalities through which the psychoreactive action takes place in the group are discussed. An indication of the psychotherapeutic treatment that is considered most adequate and rational is given. F.R.L.

A71-24999 **The response of the human visual system to moving spatially-periodic patterns - Further analysis.** David H. Foster (Imperial College of Science and Technology, London, England). *Vision Research,* vol. 11, Jan. 1971, p. 57-81. 17 refs.

Extension of an earlier investigation of visual motion response (Foster, 1969). The initial experimental evidence and the deductions based on this evidence are given further weight with a detailed mathematical structure given to the system model. Specifically, a simplified description is obtained of the V-unit, and the form of the areal dependence of the V-unit summation/threshold system is deduced. The nature of the H-unit output interaction is examined further, and an expression is derived for the general purpose of the model at motion threshold. The sinewave motion response data are then fitted. It is shown that it is necessary to modify the basic Reichardt scheme in order to reconcile the theoretical square wave motion response of the model with the observed data. The resulting expression for the square wave motion response is then used to arrive at a value for the minimum input (receptor) pair separation. M.M.

A71-25000 **Some stimulus parameters affecting spatial and temporal resolution of human vision.** J. J. Kulikowski (Polska Akademia Nauk, Instytut Automatyki, Warsaw, Poland). *Vision Research*, vol. 11, Jan. 1971, p. 83-93. 30 refs.

Contrast threshold was measured psychophysically for a sinusoidal grating presented periodically with a variable temporal frequency for various parameters of patterns. Special attention was paid to the range of high spatial frequencies as defining the resolving power of the eye. Within this range, the contrast threshold was found to be almost independent of many parameters of patterns. It was also found that the sum of certain spatial and temporal resolution indices was proportional to the logarithm of the contrast; this sum was also a logarithmic function of the average luminance in the mesopic range of luminances. M.M.

A71-25014 • **Two inducers of rapid erythroblast multiplication in vitro.** Henry Borsook, Susan Jiggins, and Rosina T. Wilson (California, University, Berkeley, Calif.). *Nature*, vol. 230, Apr. 2, 1971, p. 328-330. 21 refs. NIH-AEC-NASA-supported research.

Results of incubation of rabbit blood, buffy coat and marrow cells together for 1 hr at 37 C. There was an increase in erythroblasts, greater in the basophils than in the acidophils. There was no change in marrow incubated alone, and buffy coat alone produced no erythroblasts. Autoradiographic experiments showed that the newly formed erythroblasts all came from marrow cells. F.R.L.

A71-25039 • **Nerve disturbances following exposure to ionizing radiation.** Webb Haymaker (NASA, Ames Research Center, Moffett Field, Calif.) and Martin Lindgren (University Hospital, Lund, Sweden). In: Handbook of Clinical Neurology. Volume 7. Edited by P. J. Vinken and G. W. Bruyn. Amsterdam, North-Holland Publishing Co., 1970, p. 388-401. 79 refs.

The reactions of the peripheral nervous system to ionizing radiation are described for both experimental animals and man, with emphasis on the pathological aspects. Local and total exposures of distal neural elements, ganglion cells, spinal roots, nerve trunks, and cochlear and vestibular apparatus elements in animals are shown to cause varying degrees of damage. Changes attributed directly to radiation are distinguished from those arising later as a consequence of primary injuries. Present information on the radiovulnerability of the human peripheral nervous system is based largely on observations of effects on neural elements transirradiated in the course of therapy for neoplasms. Tolerance doses are not known, nor is there enough data to derive them empirically. The available information for cranial and spinal peripheral nervous systems is reviewed along with treatment methods. T.M.

A71-25042 **Characteristics of neural transmission from the semicircular canal to the vestibular nuclei of cats.** G. Melvill Jones (Defence Research Board, Dept. of Physiology, Ottawa, Canada) and J. H. Milsum (McGill University, Montreal, Canada). *Journal of Physiology*, vol. 209, 1970, p. 295-316. 26 refs.

The dynamic response of canal-dependent vestibular-nucleus neural units to the sinusoidal rotation of heads was studied in decerebrated or ether-anesthetized cats which were fixed in a conventional stereotaxic assembly with a moving platform. Steel microelectrodes were introduced through an opening in the occipital skull and further through the intact cerebellum to a point roughly 1 mm above the floor of the fourth ventricle. The frequency of action potentials (AP) throughout a sine wave stimulation was averaged by using a Burns neurophysiological computer. The mean gain of thirty-nine single unit responses was 0.76 AP sec per sec and varied as the (-0.28) power of stimulus angular velocity, for the five cells appropriately tested. Directionality was measured in 116 ipsilateral and contralateral units. Significant differences were not established in the mean phase or gain in the subsets of spontaneously active/inactive cells and ipsilateral/contralateral cells. V.Z.

A71-25069 **The use of in-flight manikin recordings for evaluating the communication effectiveness of flight helmets.** Carl E. Williams, James W. Greene (U.S. Navy, Naval Aerospace Medical Institute, Pensacola, Fla.), and John R. Forstall. *(Symposium on Aeromedical Aspects of Radio Communication and Flight Safety, Brooks AFB, Tex., May 13, 1969.) IEEE Transactions on Audio and Electroacoustics*, vol. AU-19, Mar. 1971, p. 97-102.

An exploratory study has been conducted to determine the feasibility of obtaining and using in-flight manikin recordings to evaluate flight helmets with respect to speech intelligibility. Intelligibility test materials were transmitted to six airborne subjects and a manikin as each was fitted with different flight helmets. Similar test materials were presented to the same six subjects in a simulated flight situation. Recordings obtained via the airborne manikin were subsequently played back in the laboratory to the six subjects and two groups of ten listeners each. Comparison of listener scores obtained in the three test situations revealed that scores obtained for the manikin recordings approximated those obtained during the in-flight tests; relative differences among three helmets for the two test situations were very similar. Standard deviations calculated from listener scores obtained for the three test situations revealed less variance for the manikin recordings. The results of the study demonstrate that a manikin head, used in conjunction with a portable tape recorder, can be flown in various types of aircraft to obtain valuable information regarding the communication effectiveness of flight helmets. (Author)

A71-25076 **Argon laser irradiation of the iris.** G. K. Watts (London, University, London, England). *Non-Ionizing Radiation*, vol. 1, Dec. 1970, p. 155-158. 5 refs. Research supported by the Ministry of Defence.

The effects of rabbit irises of a 1-mm diameter argon laser beam at energy levels up to 27 W/sq cm are described. Initial necrosis of the tissue leads to varying degrees of breakdown and thinning depending on the time and power of the exposure, and the effects produced are compared with those of a ruby laser giving the same energy. It is concluded that the obvious differences in appearance of the lesions produced by the two types of laser may be related to a mechanical (explosive) component which is present in the case of the pulsed ruby, but not in that of the continuous argon. (Author)

A71-25077 **Thermal and non-thermal cataractogenesis by microwaves.** H. D. Baillie (Manchester Royal Infirmary, Manchester, England). *Non-Ionizing Radiation*, vol. 1, Dec. 1970, p. 159-163. 14 refs.

Microwave cataractogenesis was studied in dogs. Two major types of cataract were demonstrated: coagulative and delayed. The coagulative type was caused by thermal denaturation of lens protein. The delayed cataracts were thought to be caused by an upset in lens metabolism. The initiating mechanism of the metabolic upset was investigated using a hypothermic technique and it was concluded that the initiating mechanism was entirely thermal in nature. (Author)

A71-25078 **Dissipation of microwaves as heat in the eye.** H. D. Baillie (Manchester Royal Infirmary, Manchester, England), A.

G. Heaton, and D. K. Pal (Manchester, University, Manchester, England). *Non-Ionizing Radiation,* vol. 1, Dec. 1970, p. 164-168. 16 refs.

The ability of various materials to dissipate microwave energy as heat was investigated and agar, similar to vitreous humour in this respect, was chosen for the construction of an eye model. Temperature patterns produced in the model following microwave irradiation were used to construct a graph for predicting lens temperature at the end of exposure. Discrepancies between the predicted temperatures and the temperatures obtained by direct measurement during in vivo experiments were investigated by waveguide studies on isolated lens and vitreous humour. (Author)

A71-25079 Pathophysiological aspects of microwave irradiation. 1 - Thermal effects. Sol M. Michaelson (Rochester, University, Rochester, N.Y.). *Non-Ionizing Radiation,* vol. 1, Dec. 1970, p. 169-176. 42 refs.

The thermal response of organisms, particularly human organisms, to exposure to electromagnetic radiation within the range of frequencies from 500 MHz to 10 GHz (60 to 3 cm wavelength) is examined. It is shown that radiation at frequencies below 1 GHz causes heat to be developed primarily in the deep tissues. Frequencies greater than 3 GHz cause heating of tissues in much the same manner as does infrared radiation. Radiation at frequencies between 1 and 3 GHz is subject to varying degrees of penetration and is absorbed in both surface and the deeper tissues. If the organism cannot dissipate the produced heat, the internal temperature of the body rises. If only a portion of the body is exposed, the internal temperature of the portion irradiated may rise considerably above normal. Consequently, tissue damage is more likely to occur in those areas where proportionately greater rises in temperature can occur. The eyes and testes are the most vulnerable to microwave radiation. O.H.

A71-25080 Radio hazards in the m.f./h.f. band. S. J. Rogers and R. S. King (Admiralty Surface Weapons Establishment, Portsdown, Hants., England). *Non-Ionizing Radiation,* vol. 1, Dec. 1970, p. 178-189. 7 refs.

A short review of the regulations governing safe exposure limits at microwave frequencies is given, showing the extrapolation for use at frequencies in the m.f./h.f. bands. The nature of the near field of a radiating aerial is discussed. Absorption at h.f. of the human body is analyzed, and experimental work on simulated body tissues described. It is concluded that an electric field strength of 1,000 V/m is considered to be the safe limit for continuous daily exposure to m.f./h.f. radiation. (Author)

A71-25136 * Control of concurrent avoidance and appetitive behaviors by an indicator of shock proximity. J. F. Dardano (Johns Hopkins University, Baltimore, Md.). *Journal of the Experimental Analysis of Behavior,* vol. 15, Mar. 1971, p. 167-180. 6 refs. Grants No. NsG-189-61; No. NGR-21-001-069.

Tests are described in which two rhesus monkeys were subjected to concurrent schedules where every fifth response on one lever had the dual consequence of delivering food and stepping a 20-step light counter upward. Responses on a second lever stepped the light downward. By responding appropriately to each lever, a ration of food could be obtained without exposure to a brief shock that occurred when the counter reached the twentieth step. Behavioral patterns were analyzed when the monkeys were handicapped by several types of discontinuities in the counter. The pattern of avoidance responding changed markedly only when the final four lights of the counter were inoperative. V.P.

STAR ENTRIES

N71-19399*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
INTEGRATED MANEUVERING LIFE SUPPORT SYSTEM Final Report, 31 May 1968 31 Oct. 1969
Douglas C. Howard Wright-Patterson AFB, Ohio AMRL Jul. 1970 12 p Prepared by Hamilton Std. Div., United Aircraft Corp., Winsor Locks, Conn.
(Contract F33615-67-C-1946)
(NASA-TM-X-66902; AD-714577; AMRL-TR-69-132) Avail: NTIS CSCL 06K

Successful completion of a design study of an extravehicular space suit assembly with an integrated life support system has led to the fabrication and evaluation of a human factors mockup. This mockup consists of a two-piece hard torso with soft arms and legs. A full bubble helmet and pressure gloves complete the pressure suit system. The hard torso is a volumetric representation of an integral life support system. It also contains an operational cold-gas propulsion system and controls and display panel. Sixteen thrusters provide accelerations of 0.3 ft/sec squared in three degrees of translation and 10 to 20 degrees of rotation. Author (GRA)

N71-19400# Bureau of Radiological Health, Rockville, Md. Electronic Products Div.
ELECTRONIC PRODUCT RADIATION AND THE HEALTH PHYSICIST
Oct. 1970 470 p refs Presented at the 4th Ann. Midyear Health Phys. Soc. Topical Symp., Louisville, Ky., 28 -30 Jun. 1970
(PB-195772; BRH/DEP-70-26) Avail: NTIS CSCL 06R

The Fourth Annual Midyear Topical Symposium of the Health Physics Society, cosponsored by the Blue Grass Chapter of the Society and the Bureau of Radiological Health, was held to promote exchanges of information with respect to the status, progress, and future directions in certain areas of radiation exposure. Its subject Electronic Product Radiation and the Health Physicist, encompasses a broad range of sources of exposure. Its scope extends over a large portion of the electromagnetic spectrum and includes both ionizing and nonionizing radiation. The individual presentations discuss aspects of electronic product radiation ranging from broad surveys and educational needs to specific considerations of instrumentation and biological effects. Author (GRA)

N71-19439* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
SPACE SUIT HEAT EXCHANGER Patent
Elton M. Tucker, inventor (to NASA) Issued 4 Feb. 1969 (Filed 27 Oct. 1967) 6 p Cl. 165-46; Int. Cl. F28f7/00; Int. Cl. A61f7/00; Int. Cl. F25d3/08
(NASA-Case-XMS-09571; US-Patent-3,425,487; US-Patent-Appl-SN-678700) Avail: US Patent Office CSCL 06K

A body heat exchanger for use with space suits is described which transfers thermal energy to or away from the body surface of the wearer. The heat exchanger is a very fine grid of small, flexible, high thermal conductance yarn in intimate contact with the body. Heat is transfered from the body surface into a liquid coolant loop, included as a portion of the assembly, which circulates a fluid of a desired temperature.
Official Gazette of the U.S. Patent Office

N71-19440* Solid State Radiations, Inc., Los Angeles, Calif.
BIOMEDICAL RADIATION DETECTING PROBE Patent
Fred P. Burns and Josef E. Friederichs, inventors (to NASA) Issued 11 Feb. 1969 (Filed 23 Dec. 1965) 7 p Cl. 250-83; Int. Cl. G01t1/02 Sponsored by NASA
(NASA-Case-XMS-01177; US-Patent-3,427,454; US-Patent-Appl-SN-516150) Avail: US Patent Office CSCL 06B

A biomedical nuclear radiation detecting probe for in vivo use is described. The p-type semiconductor diode fabricated from high resistivity silicon crystal is bullet shaped, and the junction is formed by diffusion of phosphorus over the nose end of the crystal. A silver casing is sleeved over the crystal with only the diffused nose of the crystal protruding. A miniature hermetically sealed coaxial cable extends through the back of the casing. The ground lead connects with the casing which is coupled to the n-type phosphorus. The bore of the casing adjacent to the electrical connection to the p-type region of the crystal is filled with a non-oxidizing gas. A reverse voltage bias is applied to the p-n junction whereby penetrating radiation gives rise to voltage pulses which are conducted by the cable to a recording apparatus.
Official Gazette of the U.S. Patent Office

N71-19579# Army Medical Research Lab., Fort Knox, Ky.
WORD READING, COLOR NAMING AND STROOP INTERFERENCE AS A FUNCTION OF BACKGROUND LUMINANCE
Frederick N. Dyer 20 Aug. Aug. 1970 22 p refs
(AD-716351; USAMRL-889) Avail: NTIS CSCL 17/8

Response times were recorded for six Ss while naming colors in conditions with and without interference to color naming and also while reading words. Processing rates of word and color information were manipulated by varying the background luminance of the color stimuli. Interference to color naming from incongruent color words was ascertained when word reading was fast relative to color naming and when the reverse was true. The relevance of this paradigm for the study of information processing is discussed.
Author (GRA)

N71-19580*# Techtran Corp., Glen Burnie, Md.
THE HEART AND SPORTS: ESSAYS ON CARDIOLOGY IN SPORTS
V. L. Karpman et al Washington NASA Feb. 1971 507 p refs Transl. into ENGLISH of the book "Serdtse i Sport, Ocherki Sportivnoy Kardiologii" Moscow, Meditsina, 1968 p 1-516
(Contract NASw-1695)
(NASA-TT-F-662) Avail: NTIS HC$6.00/MF$0.95 CSCL 06P
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N71-19581*# Techtran Corp., Glen Burnie, Md.
THE CARDIAC ACTIVITY OF ATHLETES IN THE QUIET STATE
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 2-34 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Data on the sports heart at rest are given including properties of the cardiac muscle, pulse frequency, dimensions, cardiac output and hemodynamics circulating blood mass, infracardiac and arterial pressure, relationship between expulsion period, systolic index, cardiac rhythm and diastolic pressure in the aorta, relationship between electrical and mechanical activity of the heart, heart blood supply, and regulation of cardiac activity in athletes. Author

N71-19582*# Techtran Corp., Glen Burnie, Md.
CARDIAC ACTIVITY DURING CONDITIONS OF MUSCULAR WORK
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 35-57 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

The response of cardiodynamics to physical stress is studied. Transient cardiodynamic processes during muscular work are diagrammed and described. The alterations in cardiac rhythm, blood pressure, blood volume per beat, residual blood volume in the heart, as well as relationships between phases of the cardiac cycle as a function of physical stress level are studied. The electromechanical relationships before, during, and after physical stress are described, and the recovery period following physical stress is studied. Author

N71-19583*# Techtran Corp., Glen Burnie, Md.
BLOOD CIRCULATION AND THE STATE OF TRAINING
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 58-72 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

The leading diagnostic characteristic of the state of training is not the amplitude of the reaction to a physical load, but the type of reaction, the quality and relationships between changes in individual functional indicators. Tabular data are presented indicating the types of reaction to be expected from athletes trained for strength, speed and endurance, in various states of training, and under various physical loads. Author

N71-19584*# Techtran Corp., Glen Burnie, Md.
INVESTIGATION OF CERTAIN PARAMETERS OF CARDIO AND HEMODYNAMICS
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 74-105 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

A historical review is given of the investigatory methods used to define certain parameters of cardio- and hemodynamics. Included are: methods of investigation of cardiac output, methods of phase analysis of the cardiac contraction, particularly as used in athletes, and changes in duration of cardiac cycle phases during the performance of various physical tasks. Author

N71-19585*# Techtran Corp., Glen Burnie, Md.
ELECTRICAL MANIFESTATIONS OF CARDIAC ACTIVITY
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 106-149 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Methods of recording and analyzing the electrical activity of the heart are analyzed. Included are classical methods of electrocardiography, as well as recent modifications and improvements, ranging from the application of new leads to improved methods of both statistical and graphical analysis. Case histories are presented to illustrate characteristics and appearance of electrocardiograms and vector cardiograms in various types of athletes with and without pathological heart problems. Author

N71-19586*# Techtran Corp., Glen Burnie, Md.
MECHANICAL MANIFESTATIONS OF CARDIAC ACTIVITY AND THE FUNCTIONAL STATE OF THE VESSELS
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 150-238 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Methods for analysis of the mechanical manifestations of cardiovascular activity are described. Methods include phonocardiography, dynamocardiography, vector dynamocardiography, ballistocardiography, kinetocardiography, rheocardiography, tachooscillography, and various methods of sphygmography. Each method is described and diagrammed, case histories are presented, including illustrations of the various cardiograms and sphygmograms, and methods of mathematical analysis. Author

N71-19587*# Techtran Corp., Glen Burnie, Md.
X-RAY METHODS OF INVESTIGATION OF THE CARDIAC ACTIVITY OF ATHLETES
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 239-284 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Functional X-ray methods are described for quantitative descriptions of the heart and its operation. Standard methods such as roentgenkymography are described, in addition to the recent X-ray functional method of electrokymography. Forms of roentgenkymogram rays are analyzed. Causes and manifestations of hypertrophy, principally of the left ventrical, are presented. The graphic phase analysis of electrokymograms is described, and case histories are presented. Teleroentgenography for studying heart volume is described. Author

N71-19588*# Techtran Corp., Glen Burnie, Md.
FUNCTIONAL TESTS OF THE CARDIOVASCULAR SYSTEM
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 285-314 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Cardiovascular functional tests are analyzed: (1) dynamic tests using various physical loads, (2) orthostatic tests, and (3) tests with breath held. Attempts to design functional tests specific for the muscular activity of a given sports activity are described. Manifestations of cardiovascular pathology in response to various functional tests are described. Problems in the administration of functional tests related to time lapse between performance of functional load and measurement of cardiodynamic parameter are discussed. Author

N71-19589*# Techtran Corp., Glen Burnie, Md.

SOME METHODS OF TRANSMISSION ANALYSIS OF CARDIOLOGICAL INFORMATION IN SPORTS
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 315-349 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Problems in cardiology are analyzed, including the problem of transmission of cardiological information over long distances without wires. The radio telemetry systems developed to perform this task are being continually improved in terms of stability, information transmission, and capacity. Automatic analysis of cardiological data is discussed. Author

N71-19590*# Techtran Corp., Glen Burnie, Md.
SOME CLINICAL PROBLEMS OF SPORTS MEDICINE
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 351-362 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06E

Factors resulting in disease in athletes are analyzed. These include changes in the external medium, improper and ineffective training, and intensive training exercises by persons with insufficient physical conditioning. The relationships between chronic centers of infection, more common in athletes than in non-athletes, and cardiac problems are explored. The importance of complete recovery from infectious diseases before resumption of sports training is emphasized. Author

N71-19591*# Techtran Corp., Glen Burnie, Md.
CHANGES IN THE ARTERIAL PRESSURE OF ATHLETES
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 363-384 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Data available from the rather skimpy investigations into the arterial pressure of athletes are presented. It is pointed out that although arterial pressure has been measured for decades, accurate methods capable of providing reproducible results have only recently become available, and the interpretation of the results produced also varies widely. Individual differential diagnosis must be performed in all cases of abnormal arterial pressure, either high or low. Author

N71-19592*# Techtran Corp., Glen Burnie, Md.
DISRUPTIONS OF THE CARDIAC RHYTHM IN ATHLETES
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 385-402 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

The frequency and significance of arhythmias in athletes are analyzed. Case histories are presented to illustrate that many types of arhythmia frequently described as variations of the norm in the sports heart may in actuality indicate cardiac pathology. The importance of differential diagnosis of all arhythmias is emphasized. Attempts at too rapid physical training and conditioning can lead to phemenona of cardiac overstress. Case histories, electrocardiograms, and physiological explanations are presented to illustrate the significance of measured, properly applied physical exercise, undertaken only during periods of perfect health, in the prevention of cardiac pathology in athletes. Author

N71-19593*# Techtran Corp., Glen Burnie, Md.
CARDIAC OVERSTRESS IN ATHLETES
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 403-438 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Physical overstress effects on the cardiac muscle in athletes are discussed for both acute and chronic conditions. Case histories are described and illustrated with electrocardiographic data. E.C.

N71-19594*# Techtran Corp., Glen Burnie, Md.
SYSTOLIC NOISES IN ATHLETES
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 439-459 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Analysis of phonocardiographic data produced under rest conditions and with various functional tests indicates that accidental systolic noise does not indicate mitral valve deficiency. The usage of phonocardiography for differential diagnosis of accidental and functional noise is described. Case histories are described and sample phonocardiograms are presented. Author

N71-19595*# Techtran Corp., Glen Burnie, Md.
ORGANIZATION OF CARDIOLOGICAL SERVICE IN SPORTS MEDICINE
In its The Heart and Sports: Essays on Cardiology in Sports Feb. 1971 p 460-500 (See N71-19580 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06E

The methodology of medical examination of athletes is based on broad utilization of various methods allowing complete determination of the functional capacities of the organism. The cardiological service system in sports medicine includes dispenseries, periodic obligatory physical examinations of all athletes, and scientific investigations. The organization of this system is described, and needs for its future development are noted. Author

N71-19604# Army Medical Research Lab., Fort Knox, Ky.
EVALUATION OF GUNDEFENDER EARPLUG: TEMPORARY THRESHOLD SHIFT REDUCTION AND SPEECH INTELLIGIBILITY
James D. Mosko and John L. Fletcher 9 Oct. 1970 13 p refs
(AD-716356; USAMRL-903) Avail: NTIS CSCL 6/17

Prototypes of the Sonex Gundefender earplug were evaluated with reference to the ear protection capabilities of the earplug and the speech intelligibility scores obtained in both noise and quiet conditions. The medical standard V.51R earplug was used as a comparison unit. A temporary threshold shift reduction method was used for the comparison of protective capabilities. Magnetic recordings of the Modified Rhyme Test were used to obtain the speech intelligibility data. Author (GRA)

N71-19605# Washington Univ., Seattle. Dept. of Psychology.
LEARNING AND OPTIMIZATION OF COGNITIVE CAPABILITIES Final Report
A. A. Lumsdaine, Earl Hunt, Lee R. Beach, R. R. Dagano, and H. H. Wells Jun. 1970 9 p refs
(Grant AF-AFOSR-1701-69)
(AD-716459; AFOSR-70-2761-TR) Avail: NTIS CSCL 5/10

The report summarizes briefly the work of a three-year series of experimental studies of human cognition, involving the investigation of problem solving and learning in man-machine interaction situations, and of variables and processes relevant in such situations. The work included four separate projects: Computer-aided problem solving, computer-aided instruction techniques, feedback in concept learning, and intuitive decision making. Each of the four projects was concerned with research to obtain knowledge that could contribute to the efficiency of man-machine systems functioning in making decisions and performance of various related kinds of intellectual tasks. Author (GRA)

N71-19653# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Oceanography.
WASTES MANAGEMENT CONCEPTS FOR THE COASTAL ZONE: REQUIREMENTS FOR RESEARCH AND

INVESTIGATION
1970 135 p refs
(PB-195861; W71-01544) Avail: NTIS CSCL 13B

Scientific and engineering requirements were evaluated for research related to coastal wastes management based upon 16 background papers. The major subjects under consideration were: monitoring, chemical effects, physical effects, and biological effects. GRA

N71-19671# Randomline, Inc., Willow Grove, Pa.
BIOLOGICAL FUNCTION AS INFLUENCED BY LOW POWER MODULATED RF ENERGY
Allan H. Frey Dec. 1970 49 p refs Submitted for publication
(Contract N00014-69-C-0181)
(AD-716044) Avail: NTIS CSCL 6/18

In recent years, it has been recognized that low power density modulated rf energy can affect the functioning of higher living organisms. In this paper the sparse data generated in the western hemisphere on this subject is considered, the reasons for its sparseness noted, and the hypotheses on mechanisms that may provide an explanation for the observed effects and other possible effects are sketeched. Possible conclusions with regard to hazards to personnel are then considered. Author (GRA)

N71-19674# Human Resources Research Organization, Alexandria, Va.
A PROTOTYPE PICTORIAL PROGRAM FOR A GROUND SURVEILLANCE RADAR SET OPERATOR
Joseph P. Militello and Gary G. Boycan Dec. 1969 37 p
(Contract DAHC19-79-C-0012)
(AD-716246) Avail: NTIS CSCL 5/9

The document was prepared as preliminary material for training personnel in the SEA NITEOPS Program, and as a basis for the later development of resident training programs. However, subsequent to the development of this pictorial training program, it was decided that the device would not be obtained for operational use. The pictorial program is made available as an illustration of a type of training guide, which might be useful either as an operator performance aid or as a classroom training aid. Author (GRA)

N71-19710# Human Engineering Labs., Aberdeen Proving Ground, Md.
THE EFFECT OF COCKPIT LIGHTING SYSTEMS ON MULTICOLORED DISPLAYS
John A. Barnes Dec. 1970 34 p refs
(AD-716610; HEL-TM-30-70) Avail: NTIS CSCL 1/4

The report analyzes the performance of 42 subjects reading aircraft instruments comprising various combinations of pointer/background colors viewed with both Army/Navy IPL Red and Air Force Blue-White cockpit lighting systems. The results rank the pointer/background color combinations according to the least number of scale-reading errors they produced. Author (GRA)

N71-19720# Army Edgewood Arsenal, Md.
EXHAUSTING WORK LIMITED BY EXTERNAL RESISTANCE AND INHALATION OF CARBON DIOXIDE
F. N. Craig, W. V. Blevins, and E. G. Cummings Dec. 1970 39 p refs
(AD-716580; EA-TR-4478) Avail: NTIS CSCL 6/19

The objectives of the investigation were to find the intensities of work at which the reduction in endurance associated with inspiratory resistance would be the greatest and to test various hypotheses to account for the reduction. The following conclusions were reached: The reduction in endurance in exhausting work caused by an added inspiratory resistance is greater when the intensity is such that exhaustion is reached in from 5 to 15 minutes than when higher intensities of work lead to exhaustion in a shorter time; of the various factors examined in this report, the sense of impending exhaustion appears to be associated most closely with the reduction of the duration of expiration to a minimum value characteristic of the individual; in exhausting work, men can withstand the large elevation in alveolar carbon dioxide associated with the inhalation of carbon dioxide mixture better than the smaller but still substantial elevation in alveolar carbon dioxide associated with an added inspiratory resistance. Author (GRA)

N71-19751# National Aerospace Lab., Tokyo (Japan).
A SIMULATOR EXPERIMENT TO INVESTIGATE HUMAN BEHAVIOR IN TRACKING TASKS
Goro Beppu, Tosiho Sakai, and Junichi Yoshida Aug. 1970 18 p refs In JAPANESE; ENGLISH summary
(NAL-TR-206) Avail: NTIS

The way in which human behavior in roll tracking tasks is adapted to the variation of controlled element characteristics was investigated in flight simulator experiments. The investigations were carried out by calculating the describing function of the human being Y sub p (j omega) and the open-loop describing function Y sub p Y sub c (j omega). As L sub p is large, the time constant of lead equalization in Y sub p is small. When L sub delta a is large, the time lag of human behavior is small. This means that a human being controls an airplane with large average muscle tension. When L sub delta a is too large, K sub p L sub delta a is not constant. This is due to the fact that the change in L sub delta a is too large to be compensated by K sub p. Author

N71-19772# General Electric Co., Schenectady, N.Y. Research and Development Center.
DEVELOPMENT OF A PERSELECTIVE MEMBRANE SYSTEM FOR CONTINUOUS CARBON DIOXIDE CONTROL Final Report, Jan. 1968 - Apr. 1970
Charles K. Neulander and Frederick J. Martin Wright-Patterson AFB, Ohio AMRL Oct. 1970 34 p refs
(Contract F33615-68-C-1234)
(AD-715978; S-70-1088; AMRL-TR-70-44) Avail: NTIS CSCL 6/11

An immobilized liquid film of an aqueous bicarbonate/carbonate solution, and including a catalyst for the hydrolysis of CO2, has been incorporated into a system for removal of CO2 from a life-supporting environment in space. A method of packaging the membrane is described. A one-man system, requiring 18.3 square yards of membrane, was constructed and tested. Approximately the same membrane area is required for both spacecraft cabin control and for astronaut extra-vehicular back-pack application. Permeation results are given for a variety of conditions. Virtually no oxygen is lost through the membrane, and the anticipated system has the advantage of not requiring regeneration or replacement of any components. Author (GRA)

N71-19776*# *Quantum Dynamics, Tarzana, Calif.*
SOME RECENT ADVANCES IN THE TECHNOLOGY OF HIGH RESOLUTION DYNAMIC AND CONTINUOUS RESPIRATORY AND METABOLIC MEASUREMENTS ON BREATH-BY-BREATH AND TM BASIS Final Report
Aug. 1970 136 p refs
(Contract NAS9-8185)
(NASA-CR-114905) Avail: NTIS CSCL 06B

Assigned tasks of supplying advanced bidirectional respiratory flowmeters and electronic instrumentation systems for the measurement, analysis, and computation of metabolic quantities are discussed. The main purpose is to: (1) review and analyze technological advances in respiratory and metabolic instrumentation, (2) discuss administrative, technical, and other problems encountered

during the performance of the contract, and (3) propose future effort. Author

N71-19783*# Missouri Univ., Columbia. Medical School.
THE ECOLOGY OF THE INTESTINAL FLORA IN A CHANGING ENVIRONMENT Final Report
T. D. Luckey 8 Feb. 1971 12 p refs
(Contract NAS9-10765)
(NASA-CR-114889) Avail: NTIS CSCL 06M

Background information and topics discussed at a symposium on the ecology of the intestinal flora in a changing environment are summarized including resulting publications and recommendations J.M

N71-19785*# Fairchild Hiller Corp., Farmingdale, N.Y. Manned Space Systems.
SPACE STATION/BASE FOOD SYSTEM STUDY Contract Summary Report
31 Dec. 1970 14 p
(Contract NAS9-11139)
(NASA-CR-114886; DRL-7) Avail: NTIS CSCL 06K

Detailed performance characteristics, functional descriptions, sketches, and parametric data are given for developing realistic mission models of food systems that will sustain a spacecrew for extended periods of time. The requirements established to meet these needs include: variety of food; capability to store, prepare, and serve; facilities to store required consumables and expendables; logistics and inventory control; and capability to clean equipment and dispose of resulting debris. E.M.C.

N71-19798# Rowland and Co., Haddon Field, N.H.
IN SUPPORT OF ADVANCED DEVELOPMENT OBJECTIVE 43-13, HUMAN FACTORS TECHNOLOGY Annual Report, 1 Dec. 1969 - 30 Nov. 1970
Edward Marlowe, Carlos Escobar, and George E. Rowland 30 Nov. 1970 159 p refs
(Contract N00014-70-C-0126)
(AD-716473; R/C-70-11-105; AR-1) Avail: NTIS CSCL 5/9

The report describes the approach used and the progress made in the application of existing knowledge and technology to the test of computerized techniques which incorporate adaptive training conceptsand improved techniques for the prediction of Naval flight student training success. Because these computerized techniques require a unique combination of special data inputs, data file organization, and specific computer software routines to process the file data, this combination is called a data management system. The system will consist of a newly defined data bank and file organization of student pilot selection, performance and administrative data; computerized techniques for processing these data are developed to support a series of fourteen system modules. When implemented the data management system is expected to provide improved procedures for the handling of student pilot training. These improved procedures can be expected to result in reduced attrition in the flight syllabus, more effective placement of students in the pipelines, in possible changes in the flight syllabus content, flight hours, and syllabus duration for certain students. Author (GRA)

N71-19813# Goodyear Aerospace Corp., Akron, Ohio.
WHOLE BODY AND BARE HAND COOLING AT HIGH WIND SPEEDS Final Report, Dec. 1968 - Jun. 1970
Richard A. Wilson, Kenneth Easter, Harold E. Kerber, Paul Webb, and James F. Annis Wright-Patterson AFB, Ohio AMRL Sep. 1970 109 p refs Prepared in cooperation with Webb Associates
(Contract F33615-69-C-1063)
(AD-715976; GER-14780; AMRL-TR-70-39) Avail: NTIS CSCL 6/19

Men were exposed in a wind tunnel with their backs to the wind, speeds 0 to 110 mph, at ambient temperatures of 21.1C (70F) to -31.7C (-25F) while hanging in a parachute harness clothed in Air Force flight suits at a simulated altitude of 600 feet. In summer flight suits exposures at 100 mph, -1.1C (30F) for 20 minutes following a standard precool of 10 minutes at 10 mph, were tolerated without frostbite. In winter flight suits, after precool at chosen ambient, men withstood 100 mph at -9.4C (15F) for 20 minutes and -17.8C (0 F) for 6.3 minutes. The latter test was terminated when skin on the calf reached the predetermined safety limit of 0 C (32F). At -17.8C (0 F) full 20-minutes exposure was tolerated at 50 mph. Considerable discomfort but no tissue cold damage attended the coldest runs when mean weighted skin temperatures fell as low as 16C (60.8F). Rectal temperatures rose slightly then started down near the end of each 30 minute test run. Skin temperatures measured with embedded thermocouples during direct bare hand exposures correlate well with Siples low speed windchill data; and both provide excessively conservative exposure criteria for well clothed man. Clothed full body exposure data establish a conservative basis for estimating thermally safe temperature-wind speed regimes for towing men during air-to-air rescue maneuvers. Author (GRA)

N71-19818# Boeing Co., Seattle, Wash. Military Aircraft Systems Div.
COCKPIT GEOMETRY EVALUATION, PHASE 2. VOLUME 2: HUMAN DATA Final Report, 1 Jan. - 31 Dec. 1969
Patrick W. Ryan, Wayne E. Springer, and Michael P. Hlastala Feb. 1970 311 p refs
(Contract N00014-68-C-0289)
(AD-716296; D162-10126-2-Vol-2; JANAIR-700202-Vol-2) Avail: NTIS HC $6.00/MF $0.95 CSCL 1/3

The Cockpit Geometry Evaluation Program is a collection of techniques for improved methods of evaluating the interaction and compatibility of crew members with crew stations. The primary tool for accomplishing the evaluation is a 23 joint, three dimensional man-model (BOEMAN-II) that through mathematical techniques simulated human motion. This Phase II volume is an updating of the Phase I Human Data Document (D162-10126-1). The updating includes a description of the three dimensional body segments which are placed around the link system of BOEMAN-I and a summary of available literature concerning limit, mass, and visual characteristics used in developing the man-model are also listed in this document. Author (GRA)

N71-19819# Boeing Co., Seattle, Wash. Military Aircraft Systems Div.
COCKPIT GEOMETRY EVALUATION, 2. VOLUME 3: COMPUTER PROGRAM Final Report, 1 Jan. - 31 Dec. 1969
Robert Katz, Ann Rice, and Elsie I. Nakagawa 31 Jan. 1970 437 p refs
(Contract N00014-68-C-0289)
(AD-716397; D162-10127-2-Vol-3; JANAIR-700203-Vol-3) Avail: NTIS HC $6.00/MF $0.95 CSCL 1/3

The Cockpit Geometry Evaluation Program is a development of improved methods for evaluating the physical compatibility of crew members with crew stations. The heart of the program is a 23 joint, three dimensional man-model (BOEMAN-II) that simulates the motion of humans performing tasks in a given environment. The Computer Program System ties together all developments of the project. The System utilizes an updatable bank of anthropological and environmental data. The System provides information concerning reach capability, locations and orientation of joints and body segments during movement, and/or physical interference of BOEMAN-II with the crew station and with himself, numerical performance data on joint displacement and deflection and mass displacements. Author (GRA)

N71-19820# Boeing Co., Seattle, Wash. Military Aircraft Systems Div.

COCKPIT GEOMETRY EVALUATION, PHASE 2. VOLUME 4: MATHEMATICAL MODEL Final Report, 1 Jan. 1969–31 Jan. 1970

Michael J. Healy Jan. 1970 82 p refs

(Contract N00014-68-C-0289)

(AD-716398; D162-10128-2-Vol-4; JANAIR-700204-Vol-4) Avail: NTIS CSCL 1/3

The Cockpit Geometry Evaluation (CGE) Program is developing a computerized method to evaluate the physical compatibility of crew members with crew stations beginning with the conceptual phases of the design. The method uses a mathematical link-system model of a human crew member to represent any specified member of a human population. Three approaches to the problem of simulating human motion on the computer are examined. The two most important approaches require the development of algorithms to specify values for link-system orientation parameters. Since a baseline model was required for Phase I of the CGE Program, a general mathematical technique based on nonlinear optimization was selected to solve for link-system parameters. The optimization model was refined during Phase II and validated against selected human subject motions. Author (GRA)

N71-19821# Boeing Co., Seattle, Washington. Military Aircraft Systems Div.

COCKPIT GEOMETRY EVALUATION, PHASE 2. VOLUME 5: VALIDATION Final Report, 1 Feb. 1969–31 Jan. 1970

Harland N. Sather and Arthur W. Bearse Feb. 1970 139 p refs

(Contract N00014-68-C-0289)

(AD-716399; D162-10129-Vol-5; JANAIR-700205-Vol-5) Avail: NTIS CSCL 1/3

The Cockpit Geometry Evaluation Program is a collection of techniques for improved methods of evaluating the interaction and compatibility of crew members with crew stations. The primary tool for accomplishing the evaluation is a 23 joint, three-dimensional man-model (BOEMAN-II) that mathematically simulates human motion. The validation criteria and methods for judging the performance of the man-model are discussed in this volume. A combination of statistical, numerical, and graphical analyses were used to rate the model. Included are discussions of the experimental procedures used to generate human motion and the subsequent mathematical comparative techniques. Author (GRA)

N71-19876*# General Technical Services, Inc., Upper Darby, Pa.

INTRODUCTION TO A BIOLOGICAL SYSTEMS SCIENCE

E. Bloch (Case Western Reserve Univ.), S. Cardon, A. Iberall, D. Jacobowitz (Pa. Univ.), K. Kornacker (Ohio State Univ.) et al Washington NASA Feb. 1971 332 p refs Sponsored in part by AROD

(Contract NASw-1815)

(NASA-CR-1720) Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

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9. A PHYSICAL VIEW OF METABOLIC SYSTEMS: THE BIOCHEMICAL TRANSITION FROM ORGAN SYSTEMS TO THE HIGHER CENTRAL NERVOUS SYSTEM p 198–229 refs (See N71-19885 09-04)

10. THE ROLE OF THE NERVOUS SYSTEM IN THE ORGANIZATION AND INTEGRATION OF LIVING SYSTEMS p 230–293 refs (See N71-19886 09-04)

11. THE CHEMICAL ORIGINS OF MAMMALIAN BEHAVIOR p 294–318 refs (See N71-19887 09-04)

12. SUMMARY, OVERVIEW, AND DISCUSSION p 319–327 ref (See N71-19888 09-04)

N71-19877*# General Technical Services, Inc., Upper Darby, Pa.

INTRODUCTION TO A BIOLOGICAL SYSTEMS SCIENCE: PRELIMINARIES

In its Introduction to a Biol. Systems Sci. Feb. 1971 p 1–23 refs (See N71-19876 09-04)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

Biological systems analysis is used to determine, within a hierarchical level, what relations govern time scheduled behavior during start-up, life, and degradation. The operative principle is used to design the major system components that perform high frequency functions and to combine ancillary components in assembling the overall biological system so that it meets life requirements. G.G.

N71-19878*# General Technical Services, Inc., Upper Darby, Pa.

THE ORGANIZING PRINCIPLE OF COMPLEX LIVING SYSTEMS

In its Introduction to a Biol. Systems Sci. Feb. 1971 p 24–36 refs (See N71-19876 09-04)

Avail: NTIS HC$6.00/MF $0.95 CSCL 06C

Physiological and behavioral mechanisms are considered in designing a human biosystem of dynamic oscillatory characteristics. Long term behavior is represented by the continued effort to shift internal state patterns in order to bring them into concordance with an image ideal that represents an abstract pattern of internal physical-chemical states. G.G.

N71-19879*# General Technical Services, Inc., Upper Darby, Pa.

HIERARCHICAL REGULATION IN THE COMPLEX BIOLOGICAL ORGANISM

In its Introduction to a Biol. Systems Sci. Feb. 1971 p 37–49 refs (See N71-19876 09-04)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

Hierarchical organized complexes found within man are discussed. Considered are: (1) process maintenance and exchange at the cellular level; (2) internal process organization and logic for the macrosystem; and (3) factory operation of the biosystem in its total environment. The gross system and its dynamic responses are evaluated for steady and transient states by determining times and spatial courses of the major identified fluxes and potentials, and the modes of motor actions that the system exhibits. A homeokinesis model is formulated that achieves metabolic regulation by dynamic overlay of level upon level of behavioral performance. G.G.

N71-19880*# General Technical Services, Inc., Upper Darby, Pa.

SUMMARY OF SOME OF THE ABSTRACT PRINCIPLES

FOR A BIOSYSTEMS SCIENCE
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 50–55 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

Summarized are the fundamental principles for forming bioscience models: (1) homeokinesis; (2) spatial and temporal biospectroscopy; (3) system instability; (4) behavioral modalities; and (5) hierarchical regulation. G.G.

N71-19881*# General Technical Services, Inc., Upper Darby, Pa.
AN INTRODUCTION TO STRUCTURES AT THE LOWER LEVELS OF ORGANIZATION
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 56–75 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

The dynamic nature of active transport at the membrane level is clarified by forming functional models for the relationships between nucleic acid polymers and protein synthesis. Informational and functional substances contained in cell membranes are outlined and their effects on molecular transport modes and mechanisms are discussed. G.G.

N71-19882*# General Technical Services, Inc., Upper Darby, Pa.
SOME COMMENTS ON CONTROL OF THE MICROVASCULAR SYSTEM
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 76–112 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Some aspects of the role of the microvascular system in maintaining homeokinesis of the whole animal, i.e., in man and other vertebrates are examined. Particular emphasis is placed on: (1) the dynamics of form (the morphokinesis of the system); (2) the mechanisms that have been suggested for controlling the system (the dynamics of function) with their attendant successes and problems; and (3) recommendations for experiments that may further elucidate the control mechanisms. Author

N71-19883*# General Technical Services, Inc., Upper Darby, Pa.
THOUGHTS CONCERNING AUTONOMIC NERVOUS SYSTEM CONTROLLING INFLUENCES
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 113–129 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Physiological actions that suggest peripheral autonomic controlling effects on the nervous system are studied. Ganglia are considered as isolated little brains displayed from the CNS to the periphery where their physiological functions provide electrical dynamic impulses. Biological action and interaction models for ganglia end organ and cardiovascular system control mechanisms are depicted. G.G

N71-19884*# General Technical Services, Inc., Upper Darby, Pa.
THE CARDIOVASCULAR SYSTEM
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 130–197 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

Biological models for cardiac and vascular functions are developed by evaluating cardiovascular system responses to rest and exercise parameters. A steady state algebraic model is used to compute functional curves of the parametric alterations contained in blood flow, oxygen consumption, and metabolism of the mammalian CV system. G.G.

N71-19885*# General Technical Services, Inc., Upper Darby, Pa.
A PHYSICAL VIEW OF METABOLIC SYSTEMS: THE BIOCHEMICAL TRANSITION FROM ORGAN SYSTEMS TO THE HIGHER CENTRAL NERVOUS SYSTEM
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 198–229 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

General aspects of cellular metabolic bioenergetic systems are developed and used to interpret human and plant behaviors in which repetitive metabolic performances are achieved by the flow of chemical signals. Oscillatory, limit-cycle chemical systems govern biological processes at primitive levels; hormonal messengers provide the coupling between metabolic processes and environmental factors and affect protein synthesis. It is concluded that periodic performances of metabolic systems appear at the lowest level of an organization that meets the criteria of life; a single hormone controls processes occurring in multiple time domains. Hierarchical bioenergetic mechanisms affected by hormones involve biochemical chains, membrane transports and the microcirculation in animals. For man the prime mover of the metabolic system is the willing into action of skeletal muscle masses with the resulting consumption of oxygen, glucose, and fatty acids followed by the adoption of new states through commands issued by intracellular signals, metabolites, tissue substances released locally, neural transmitters, and hormones. G.G.

N71-19886*# General Technical Services, Inc., Upper Darby, Pa.
THE ROLE OF THE NERVOUS SYSTEM IN THE ORGANIZATION AND INTEGRATION OF LIVING SYSTEMS
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 230–293 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

Various biological models are formed that illustrate the regulatory mechanisms of cellular activities by specific enzymes which themselves are specified by the genetic apparatus of the cell from information stored within the cell's DNA. Modifications of the cell's structure are regulated by the relative rate of synthesis for each possible enzyme. The nervous system evaluates stimuli and triggers the regulatory enzymatic activities that are necessary. G.G

N71-19887*# General Technical Services, Inc., Upper Darby, Pa.
THE CHEMICAL ORIGINS OF MAMMALIAN BEHAVIOR
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 294–318 refs (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06A

The effects of hormonal-metabolic states on human and mammalian behaviors are discussed. Metabolic component levels in blood, hormonal levels and times of action, and human behavior are correlated to form a matrix whose columns represent chemical materials, chemical process changes, hormonal and behavioral modes, and whose rows show discrete time intervals. Couplings may take place between hormones and processes or components or among the components and processes themselves. G.G.

N71-19888*# General Technical Services, Inc., Upper Darby, Pa.
SUMMARY, OVERVIEW, AND DISCUSSION
In its Introduction to a Biol. Systems Sci. Feb. 1971 p 319–327 ref (See N71-19876 09-04)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06C

Principles by which complex biosystems can be defined within physical and biological contexts are: (1) homeokinesis; (2) spatial and temporal biospectroscopy; (3) system instability; (4) behavioral modalities; and (5) hierarchial regulation. These dynamic systems are used to formulate biological models for membrane activities, the microvasculature, the nervous autonomic system, the biochemical chains, the higher nervous structure and function, and the hormonal effects on behavior. G.G.

N71-19911# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

PLACEMENT OF AIRCRAFT CONTROLS

John W. Garrett, Milton Alexander, and Chester W. Matthews Sep. 1970 459 p refs

(AD-715975; AMRL-TR-70-33) Avail: NTIS CSCL 1/3

Data are presented to guide the designer in placing aircraft controls to be operated by lightly clothed or pressure-suited aircrewmen. The capabilities of 17 subjects wearing various combinations of personal equipment to reach 81 locations within a 180 deg arc forward of seat reference point were determined. Each subject was tested while wearing personal equipment, consisting of an underarm life preserver, parachute harness and, successively, a K2B flight coverall, an uniflated, and inflated A/P22S-2 full-pressure suit. The subjects sat in a seat configured to approximate Air Force specifications. During the test they were restrained in the seat by a lap belt and shoulder straps with the inertial reel locked and again with the inertial reel unlocked. Pictorial descriptions of the dimensions, the reach capabilities of each subject, and recommended design values are presented. Author (GRA)

N71-19917# Public Health Service, Las Vegas, Nev. Southwestern Radiological Health Lab.

ENVIRONMENTAL SURVEILLANCE FOR PHOEBUS 2A REACTOR TEST SERIES Final Report, May–Jul. 1968

Oct. 1970 54 p refs

(AEC Order SF-54-373)

(SWRHL-72-r) Avail: NTIS

The Phoebus 2A nuclear reactor was tested through five Experimental Plans (EP's) at Test Cell C. Radiological monitoring and environmental sampling in off-site areas surrounding the Test Range Complex were conducted. During EP 3, 4, and 5, the reactor was operated at power levels near 2000, 4000, and 4000 MW, respectively, releasing airborne radioactivity which was detected in off-site areas. As a result of these tests, some radioactive contamination occurred off-site which was detected in air and vegetation samples collected following the three tests and additionally in milk and cow feed samples collected for EP 4 and 5. The maximum external radiation exposure measured off-site following EP 5 was less than 0.1 mR at Queen City Summit, an unpopulated area. The maximum postulated absorbed dose to the thyroid of a child with a 2-g thyroid was 13 mRad at Blue Eagle Ranch following EP 5. These doses were below radiation protection standards. Author (NSA)

N71-20006*# Space/Defense Corp., Birmingham, Mich. Basic and Applied Research Staff.

[RESPIROMETER DEVELOPMENT PROGRAM AND GRAVITY AND NEUROHYPOPHYSEAL SECRETORY ACTIVITY] Final Technical Report

8 Jan. 1971 35 p refs

(Contract NASw-870)

(NASA-CR-117179; TR71-102) Avail: NTIS CSCL 06B

The design, development, and testing of microrespirometers are described. Single specimen respirometer prototypes were developed to measure oxygen consumption of a sprouting potato plug for 90 days, compatible with a life support system on an unmanned spacecraft such as the Pioneer. A multispecimen respirometer was also designed to measure a biostatistically significant sample. It is felt that the microrespirometers are space flight-qualified with respect to sensitivity and accuracy as functions of size, weight, volume, and power. Initial research studies on the hypothalamo-hypophyseal system of fresh water teleosts under a variety of modes in a one-g environment are also described. The major efforts were on design of an environmental control system, development of surgical procedures for bilaterally eliminating the utriculi in fish, and inducing voluntary reorientation relative to the earth's gravitational field with altered light cues. Bioassay and immunology programs are discussed. N.E.N.

N71-20010# Atomic Energy Commission, Oak Ridge, Tenn.

SYMPOSIUM ON NEUTRONS IN RADIOBIOLOGY

[1969] 596 p refs Conf. held at Oak Ridge, Tenn., 11–14 Nov. 1969; sponsored by Tenn. Univ.-AEC Agr. Res. Lab. and ORNL

(CONF-691106) Avail: NTIS HC$6.00/MF$0.95

Papers are presented from the symposium on neutrons in radiobiology which are devoted to neutron dosimetry and biophysics, relative biological effectiveness, genetic effects, repair and recovery, and modifying factors. Although there were no papers devoted entirely to therapy, various parameters were examined from the standpoint of utilizing neutrons in human cancer therapy. J.M.

N71-20076# Advisory Group fo Aerospace Research and Development, Paris (France).

GLOSSARY OF AEROSPACE MEDICAL TERMS, ENGLISH-FRENCH AND FRENCH-ENGLISH [GLOSSAIRE DES TERMES UTILISES EN MEDECINE AEROSPATIALE, ANGLAIS-FRANCAIS ET FRANCAIS-ANGLAIS]

D. I. Fryer, ed. Jan. 1971 54 p ref In ENGLISH and FRENCH Revised

(AGARD-AG-153-71; AGARDOGRAPH-153) Avail: NTIS

A glossary of new terms is presented by the AGARD Aerospace Medical Panel. The terms are limited to those having a specific meaning in Aerospace Medicine or peculiar to that field of study. Author

N71-20113*# Matrix Corp., Alexandria, Va. Human Factors Div.

EFFECTS OF NOISE AND VIBRATION ON COMMERCIAL HELICOPTER PILOTS. RESULTS OF PHASE 1 RESEARCH Final Report

Thomas B. Malone, George A. Schweickert, Jr., and James M. Ketchel 7 Apr. 1970 101 p refs

(Contract NASw-1829)

(NASA-CR-117181) Avail: NTIS CSCL 06P

The effects of appropriate noise and vibration levels on commercial helicopter pilots are discussed including effects on pilot safety, on pilot performance, and on pilot comfort. It is concluded that noise levels expected in commercial helicopters do pose a problem for the pilot since they generally exceed accepted damage risk limits, although no findings were identified which demonstrate long term or chronic effects of vibration on pilot physical condition. Author

N71-20148# Defence Research Establishment Toronto, Downsview (Ontario).

EFFECT OF COLD EXPOSURE ON THE HOMING PERFORMANCE OF TRAINED PIGEONS

S. D. Livingstone and E. D. L. Topliff Sep. 1970 6 p refs

(DRET-723) Avail: NTIS

Homing pigeons, trained over increasing distances up to a maximum of 56 kilometers, were exposed intermittently to cold for a total duration of 132 hours. Concurrently a trained control group of similar size, paired by age with the test group, was kept at 24 C ambient temperature. After the period of exposure was complete both groups were flown over the 56 kilometer distance of the training course and their individual times to home were recorded. All birds returned to the coop. A significant impairment of homing performance was observed in the cold exposed birds relative to that of the controls. Author

N71-20150*# Techtran Corp., Glen Burnie, Md.

THE METHOD OF DETERMINING THE INGESTIVE AND DIGESTIVE CAPABILITY OF NEUTROPHILS [K METODIKE

OPREDELENIYA POGLOTITELNOY I PEREVARIVAYUSHCHEY SPOSOBNOSTI NEYTROFILOV]
A. I. Ivanov et al Washington NASA Mar. 1971 7 p refs Transl. into ENGLISH from Lab. Delo (Moscow), no. 10, 1967 p 610-613
(Contract NASw-2037)
(NASA-TT-F-13553) Avail: NTIS CSCL 06M

A modification of the Berman-Slvaskaya method is described for determining the digestive capability of neutrophils. Phagocytized microbial cells were cultivated on a medium of meat-peptone broth for 45 minutes after an initial incubation of the bacteria and blood mixture for 30 minutes at 37 C. A broth to blood ratio of 1:1 or 2:1 eliminated the necessity for preliminary centrifuging. The method described permits determination of the percent of phagocytosis, phogocytic number, phagocytic index, index of digestion, and also, in the presence of a leucocytic formula, the total number of ingested and digested microorganisms in 1 cu mm of blood. Author

N71-20165*# Naval Aerospace Medical Inst., Pensacola, Fla.
A TECHNIQUE FOR PRODUCING CALISTHENIC BEHAVIOR IN A RHESUS MONKEY
John de Lorge 1 Dec. 1970 16 p refs
(NASA Order L-43518)
(NASA-CR-117308; NAMRL-1124) Avail: NTIS CSCL 06C

A technique for exercise to counteract the effect of zero gravity on skeletal muscles in unrestrained monkeys during extended orbital spaceflight was explored. A rhesus monkey was reinforced with both food and food-associated stimuli for making a high-effort response continuously for 3 to 4 hours. Various manipulations of the frequency of food reinforcement and signals indicating the availability of food were used to evaluate the effect of each on the exercise response and associated behavior. The technique satisfactorily maintained exercise for up to 3 hours. A 50-percent reduction in the density of food reinformcement reduced exercise response rates by less than 25 percent. Removal of a signal that indicated the nonavailability of food had no significant permanent effects but did lead to a small increment in the exercise response rate. Presenting signals similar to the one that indicated food availability merely confused the animal and drastically lowered the exercise response rate. Author

N71-20169*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SURVIVAL OF ANTARCTIC DESERT SOIL BACTERIA EXPOSED TO VARIOUS TEMPERATURES AND TO THREE YEARS OF CONTINUOUS MEDIUM-HIGH VACUUM
R. E. Cameron and H. P. Conrow 1 Feb. 1971 10 p refs
(Contract NAS7-100; Grant NSF C-585)
(NASA-CR-117313; JPL-TR-32-1524) Avail: NTIS CSCL 06M

Samples of cold desert soil containing viable bacteria from McKelvey dry valley, Southern Victoria Land, Antarctica were subjected to 3 years of continuous medium-high vacuum of 0.001 to 0.0001 torr at room temperature and storage for 4 years at −30, −5, +5, and +20 C. Dependent upon storage temperatures, the survivability of bacteria decreased with increase in temperatures, with only 3 bacteria/g of soil surviving at room temperature in vacuum, and 500 bacteria/g of soil surviving storage at −30 C. Corynebacterium sp., a soil diphtheroid, constituted approximately 90% of the surviving populations. Arthrobacter spp. and a Micrococcus sp. also survived, but no Bacillus spp. survived in any of the samples, although they were present in the soil when it was cultured soon after collection. The reduction in abundance and kinds of bacteria from this naturally harsh terrestrial environment is relevant to the importance of storage conditions for return of Martial soil samples. Based upon Antarctic soil microbial ecology as a Mars model, the most likely life forms for a Martial cold desert soil ecosystem are diphtheroid-like microorganisms. Author

N71-20172*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROWTH OF BACTERIA IN SOILS FROM ANTARCTIC DRY VALLEYS
R. E. Cameron (JPL) and E. L. Merek Pasadena, Calif. JPL 1 Feb. 1971 17 p refs
(Contract NAS7-100)
(NASA-TM-X-66965; JPL-TR-32-1522) Avail: NTIS CSCL 06M

Microbial response was studied in four cold desert surface soils following moist soil incubation. Soils were typical Antarctic dry valley saline sands, low in organic matter content and low in abundances and kinds of viable microorganisms. Moist soil incubation increased the viable counts of three of the four soils. Most of the bacteria could grow at temperatures of 8 C; however, they grew more rapidly at 25 C. Failure of isolants from three of the soils to grow in sea salts medium indicated that they were probably not marine contaminants. It is suggested that the organisms in the three soils are probably indigenous organisms. They have adapted to the cold desert Antarctic terrestrial ecosystem, which provides a soil microbial ecology as a Mars model. Author

N71-20176# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
RADIOSENSITIVITY OF THE SWISS-RAP MOUSE AS A FUNCTION OF ITS GROWTH RATE [RADIOSENSIBILITE DE LA SOUCHE DE SOURIS SWISS-RAP EN FONCTION DE SON TAUX DE CROISSANCE]
Gerard Legeay and Jean-Francois Glas Apr. 1969 16 p refs In FRENCH
(CEA-R-3797) Avail: AEC Depository Libraries

The results are reported from an exhaustive study of the age-dependence of the gamma-radiosensitivity of female Swiss-Rap mice. A close relation between radiosensitivity and age could not be demonstrated, whereas the weekly growth rate could be accurately related to radiosensivity. Thus, the latter should be studied when this strain is to be used for biological experiments. The rates of growth differ with the strain of mice. Author (NSA)

N71-20179*# Scripta Technica, Inc., Washington, D.C.
EFFECT OF LITHIUM AND CALCIUM IONS ON THE ACETYLCHOLINESTERASE ACTIVITY OF ERYTHROCYTES [VLIYANIYE IONOV LITIYA I KALTSIYA NA AKTIVNOST ATSETILKHOLINESTERAZY ERITROTSITOV]
A. P. Brestkin et al NASA Mar. 1971 7 p refs Transl. into ENGLISH from Biokhimiya (Moscow), v. 35, no. 4, 1970 p 652-666
(Contract NASw-2036)
(NASA-TT-F-13476) Avail: NTIS CSCL 06C

A study was made of the effect of LiCl and CaCl2 on the hydrolysis rate of acetylcholine under the action of acetylcholinesterase from bovine erythrocyte stroma at pH 7.8 and 37 C. It was found that in a relatively small concentration (0.05N) these salts activate the enzyme reaction to the same extent, the activation increasing with an increase in the salt concentration up to 0.1 N. The shape of the kinetic curves, plotted in the coordinate system initial reaction rate vs. substrate concentration(s), does not differ substantially from the shape of the control curve when these salts are not present. At very high salt concentrations (1.5 and 3.0 N) the effect of the salts has a different character; at small values of s on inhibition, and at high s values an activation of the reaction is observed. A substrate inhibition is not observed in this case. A discussion of the observed effects is given, based on the assumption of a change in the structure of the active surface of the enzyme molecule under the influence of these salts. Author

N71-20187*# Scientific Translation Service, Santa Barbara, Calif.
BIOASTRONAUTICS AND EXTRATERRESTRIAL LIFE

[BIOASTRONAUTICA Y VIDA EXTRA TERRESTRE]
Horacio Marco Moll Washington NASA Mar. 1971 20 p Transl. into ENGLISH from Rev. de Aeron. y Astronautica (Madrid), v. 30, no. 358, Sep. 1970 p 663–673
(Contract NASw-2035)
(NASA-TT-F-13467) Avail: NTIS CSCL 06B

Consideration of biological exploration of space as a possible means of determining the origin of life on the earth. Russian and American experiments with probes and satellites are briefly outlined, and attention is given to the possibility of life on Venus, Mars, and Jupiter. The possibilities of extraterrestrial life are closely related to profound structural changes of life material which, on those planets, has adapted to the environmental conditions which are different from those on earth. Author

N71-20204# General Electric Co., Philadelphia, Pa. Environmental Sciences Lab.
CONTAMINATION STUDIES IN A SPACE SIMULATED ENVIRONMENT
David L. Enlow *In* NBS Space Simulation Oct. 1970 p 51–77 refs (See N71-20201 09-11)
Avail: SOD $5.25

Biological and optical contamination problems can be best investigated experimentally. Studying the dynamics of microorganisms in a vacuum environment showed that shock forces in the order of a 1000 g's will liberate 20 percent of the previously bound particles and the effect of simulated attitude control gas jet firing will remove more than 50 percent of the bound particles. A potential source for optical degradation to infrared systems is identified as the absorption phenomena of condensed volatile products from certain polymeric materials. The effects of this condensation were analyzed by a combination of surface photography and IR spectroscopy. Author

N71-20205# General Electric Co., Philadelphia, Pa. Space Div.
EXTERNAL SPACECRAFT CONTAMINATION MODELING AND COUNTERMEASURES
Theodore Baurer, M. H. Bortner, Irwin M. Pikus, and Arnold M. Cooper (Grumman Aerospace Corp.) *In* NBS Space Simulation Oct. 1970 p 79 103 refs (See N71-20201 09-11)
Avail: SOD $5.25

The problem of spacecraft external contamination is a function of both the spacecraft and the receptors, in relation to the natures and quantities of contaminants involved, i.e., the problem depends on both design and mission. The relevant phenomenology may be conceptualized in a model which assumes that a mass transfer mechanism is operative, including sources, transport modes, and sinks. Typical sources include engine debris, jettisoned wastes, outgassing, and cabin leakage. Impacting particulates adhere or scatter at the dielectric surface depending on the relative magnitudes of local surface potential, strength of induced dipoles, and particle velocity vectors normal to the surface. This model suggests approaches to the problem of counteracting contamination, viz., passive prevention, active removal measures during the transport of contaminants and means of counteracting or discounting the effects of contaminants. Author

N71-20239*# Hayes International Corp., Huntsville, Ala. Missile and Space Support Div.
DEVELOPMENT OF AN OPEN CIRCUIT CRYOGENIC LIFE SUPPORT SYSTEM FOR USE IN NEUTRAL BUOYANCY SPACE SIMULATION
C. M. McClure and C. W. Williams *In* NBS Space Simulation Oct. 1971 p 623–649 Sponsored by NASA (See N71-20201 09-11)
(NASA-CR-117143) Avail: NTIS; SOD $5.25 CSCL 06K

A self contained underwater life support system which can supply a breathing mixture to the neutral buoyancy test subject, without a surface tethered supply line is discussed. A prototype system has been developed which utilizes a mixture of liquid oxygen and liquid nitrogen contained in a single supply tank. Development and testing have shown that this system will supply the quantity and quality of gas required under completely controlled and predictable condtions to depths of at least 60 feet. Author

N71-20268* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
G CONDITIONING SUIT Patent
Clinton Eugene Brown and Ralph W. Stone, Jr., inventors (to NASA) Issued 19 Aug. 1969 (Filed 2 Feb. 1965) 8 p Cl. 128-1; Int. Cl. A61b19/00
(NASA-Case-XLA-02898; US-Patent-3,461,855; US-Patent-Appl-SN-429932) Avail: US Patent Office CSCL 06B

A G conditioning suit is described which is operative on the cardiovascular system of a body to make it function as it normally does in a gravity environment. The suit structure and associated apparatus is designed such that a decreasing pressure is applied from the area of the head to the feet thus controlling the flow of blood in a body to accomplish the result gravity has on the cardiovascular system. Detailed descriptions accompany drawings of the device. Official Gazette of the U.S. Patent Office

N71-20286*# Sandia Corp., Albuquerque, N.Mex.
THE PREPARATION AND ASSAY OF T4 BACTERIOPHAGE
Ralph E. Trujillo Feb. 1971 17 p refs
(NASA Order W-12853)
(NASA-CR-117172; SC-RR-710107) Avail: NTIS CSCL

A method is described for the preparation and assay of T4 bacteriophage in which the process of phage infection, multiplication, and subsequent bacterial host cell lysis serve as the basis for the procedure. The description is of sufficient detail to allow persons unfamiliar with virology techniques to successfully utilize and study the phage system. Author

N71-20351# Advisory Group for Aerospace Research and Development, Paris (France).
ADAPTATION AND ACCLIMATISATION IN AEROSPACE MEDICINE
H. J. Grunhofer, ed. Mar. 1971 202 p refs Presented at 27th Aerospace Med. Panel Meeting, Garmish-Partenkirchen, West Germany, 14–18 Sep. 1970
(AGARD-CP-82-71) Avail: NTIS

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10. IMPULSIVENESS AND ANXIETY RELATED TO PERCEPTUAL MOTOR PERFORMANCE E. S. Barratt (Texas Univ., Galveston) and G. Tolhurst (ONR, Arlington, Va.) 5 p refs (See N71-20361 09-04)

11. EFFECTS ON HUMAN PERFORMANCE OF COMBINED ENVIRONMENTAL STRESSES W. F. Grether (AMRL) 10 p refs (See N71-20362 09-04)

12. THE NOVEL TASK AS A MEASURE OF PERFORMANCE UNDER ENVIRONMENTAL STRESS M. F. Allnutt (Royal Air Force Inst. of Aviation Medicine, Farnborough, England) 4 p refs (See N71-20363 09-04)

13. IS LABORATORY EXPERIMENTATION USEFUL FOR STUDYING HUMAN ADAPTATION TO UNINHABITABLE SENSORY ENVIRONMENTS? R. Angiboust (Centre D'Enseignement Et De Recherches De Medecine Aeronautique, Paris, France) 7 p (See N71-20364 09-04)

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15. EXPERIMENTAL RESEARCH ON HEAT BALANCE OF ATHLETES OF VARIOUS SPECIALTIES, DURING MUSCULAR EXERCISE IN DIFFERENT THERMAL ENVIRONMENTS P. Rota (Italian Air Force Aerospace Medical Center, Rome, Italy) and A. Todaro (Accident Prevent. Natl. Agency Res. Center) 8 p refs (See N71-20366 09-04)

16. ENERGY METABOLISM DURING EXPOSURE TO EXTREME ENVIRONMENTS C. F. Consolazio, H. L. Johnson and H. J. Krzywicki (Army Medical Research and Nutrition Lab.) 11 p refs (See N71-20367 09-04)

17. METABOLIC IMBALANCES AND BODY HYPOHYDRATION DURING FOOD DEPRIVATION (10 DAYS) C. F. Consolazio, H. L. Johnson, and H. J. Krzywicki (Army Medical Research and Nutrition Lab.) 8 p refs (See N71-20368 09-04)

18. THE INFLUENCE OF ENVIRONMENTAL FACTORS IN AIRCRAFT CARRIER LANDINGS AND ACCIDENTS C. A. Brictson (Dunlap and Associates, Inc., Santa Monica, Calif.) 7 p refs (See N71-20369 09-02)

19. EFFECT OF ACUTE AND CHRONIC EXPOSURE TO 21 MM HG AMBIENT P SUB CO2 ON EXERCISE RESPONSE OF NORMAL MAN R. D. Sinclair, J. M. Clark, and B. E. Welch (School of Aerospace Medicine) 9 p refs (See N71-20370 09-04)

20. VOLITIONAL CONTROL OF VISUAL ACCOMMODATION R. J. Randle (NASA, Ames Research Center, Moffett Field, Calif.) 13 p refs (See N71-20371 09-04)

N71-20352# Office of Naval Research, Arlington, Va.

ACCOUSTIC FATIGUE OF HUMANS EXPOSED TO NOISE

Gilbert C. Tolhurst *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 8 p refs (See N71-20351 09-04)

Avail: NTIS

Since human fatigue is not truly a precise phase, by borrowing an analogy from the material sciences, an attempt has been made to outline both physiologically and psychologically the limits and ranges of the response to acoustic stimuli, termed elasticity, deformation and destruction. The precision is no better or no worse than the same terms applied to metal fatigue. Present damage-risk criteria, if strictly applied by industry, the military, or by social services organizations, should materially reduce the incidence of noise induced hearing losses to approximately 85 to 95 percent of a population. Considerable amounts of data are needed to allow any particular individual's susceptibility to be predicted with precision. While considerable research effort has yielded ever increasingly elegant methods to quantify potentially hazardous noise environments, as well as communications interferring ones, the consequences of prolonged noise exposure need extensive experimental validation. Author

N71-20353# Army Medical Research Lab., Fort Knox, Ky. Experimental Psychology Div.

GROWTH AND RECOVERY OF TEMPORARY THRESHOLD SHIFTS FOLLOWING EXTENDED EXPOSURE TO HIGH LEVEL, CONTINUOUS NOISE

James D. Mosko and John L. Fletcher *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 7 p refs (See N71-20351 09-04)

Avail: NTIS

Requirements of long term operations for both air and ground military personnel have increased in recent years, and the probability of having such personnel exposed to hazardous noise levels and durations has increased. Research was undertaken to investigate the effects of long term exposure on the auditory thresholds for discrete tonal signals and the recovery from any temporary threshold shift. Evidence indicates a gradual growth in temporary threshold shift (TTS) over 12 – 16 hours of exposure, with an asymptotic TTS configuration extending through 48 hours of exposure. Full recovery is attained in approximately 23 – 24 hours after cessation of exposure. The results of this research could lead to reconsideration of the damage risk criteria for noise exposure, and to the design of protective devices. Author

N71-20354# Randomline Inc., Willow Grove, Pa.

CARDIAC AND NEURAL EFFECTS OF RADAR WAVELENGTHS

Allan H. Frey *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 6 p (See N71-20351 09-04)

Avail: NTIS

Results of experimentation on the cardiac effects of UHF energy are reviewed. A series of three experiments were conducted, the first two experiments used isolated frog hearts and the third used intact frogs. The UHF energy was synchronized with events in the ECG in an attempt to drive the heart. Synchronization with the R wave had significant effects. Author

N71-20355# Matrix Corp., Alexandria, Va.

FLIGHT CREW ADAPTABILITY TO THE HELICOPTER VIBRATION ENVIRONMENT

J. W. Danaher *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 5 p refs Sponsored by ONR (See N71-20351 09-04)

Avail: NTIS

Interpretations of research literature concerning the effects of vibration on man are presented. Described are some effects of vibration on the performance of certain flight crew tasks required by emerging helicopter missions. Specifically, the implications for long duration, search and rescue, and assault support missions are discussed. Tasks associated with the operation of various human sensory systems, digital input devices, and helmet-mounted and other displays are also analyzed. Areas requiring further research are defined and engineering approaches to the solution of the helicopter vibration problem are outlined. Author

N71-20356*# National Aeronautics and Space Administration, Washington, D.C.

VIBRATION IN V/STOL AIRCRAFT

Walton L. Jones *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 10 p refs (See N71-20351 09-04)
(NASA-TM-X-66956) Avail: NTIS CSCL 06S

The ride comfort program being conducted at Langley Research Center is described. This program assesses those characteristics of V/STOL vibration which influence human comfort. Vehicle measurements correlated with the results from simulation experiments will yield the recommended ride comfort criteria. Also described is: (1) a planned study of an active vibration isolation system designed to eliminate approximately 90% of the vibration at the primary frequency of 18 cycles per second; and (2) a ride comfort simulator having three degrees of freedom, a payload capacity of 5,000 pounds, and vertical and lateral direction having peak-to-peak double amplitude of six inches with plus and minus 0.5 g. A.L.

N71-20357# Royal Air Force Inst. of Aviation Medicine Farnborough (England).

EFFECT OF POSTURE ON TOLERANCE TO POSITIVE (Gz) ACCELERATION

R. J. Crossley and D. H. Glaister *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 8 p refs (See N71-20351 09-04)
Avail: NTIS

The effect of varying the posture of eight subjects on their relaxed greyout thresholds has been studied. Six angles of the seat back between 70 deg to the horizontal and 15 deg, and rates of onset of acceleration of 1.0 g/sec and 0.1 g/sec were used. The g thresholds of all subjects, with both rates of onset, increased as the back angle decreased and were directly proportional to the reciprocal of the vertical distance between the eye and the haemodynamic indifference point. The degree of neck flexion was observed to have little effect on the thresholds at any one angle. Four subjects also wore an anti-g suit for further threshold determinations with seat back angles of 70 deg, 30 deg and 15 deg. The increase in thresholds produced by the anti-g suit was the same for each angle. Comparison of the thresholds observed with the two rates of onset show that the 0.1 g/sec rate leads to higher thresholds than the 1.0 g/sec rate. These studies indicate that a near-supine posture combined with an anti-g suit can provide relaxed g thresholds in the region of 6 to 8 g while permitting adequate forward vision. Such a posture would have the added advantage of exposing the aircrew to + g sub x acceleration during ejection. Author

N71-20358*# Mayo Clinic, Rochester, Minn. Graduate School of Medicine.

EFFECTS OF POSITIVE Gy ACCELERATION ON BLOOD OXYGEN SATURATION AND PLEURAL PRESSURE RELATIONSHIPS IN DOGS BREATHING FIRST AIR, THEN LIQUID FLUOROCARBON IN A WHOLE BODY WATER IMMERSION RESPIRATOR

D. J. Sass, E. L. Ritman, P. E. Caskey, J. Greenleaf, N. Banchero et al *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 15 p refs Sponsored in part by Navy (See N71-20351 09-04)
(Grant NGR-24-003-001; Contract F41609-69-C-0058; Grant NIH HE-3532)
(NASA-CR-117199) Avail: NTIS CSCL 06S

A total body water immersion, mechanical respiration, body support assembly has been used with dogs on the human centrifuge to compare effects of +1 Gy and +6 Gy acceleration on cardiovascular and respiratory function in dogs under three conditions: (1) normal respiration in air; (2) totally immersed in a saline-filled respirator chamber providing control of respiratory rate, tidal and residual volumes when breathing air or oxygen; and (3) when respired in the same manner with oxygenated liquid fluorocarbon. The results indicate that: (1) arterial hypoxemia due to dependent pulmonary arteriovenous shunting caused by acceleration is not minimized by water immersion alone; (2) dogs can be respired with liquid fluorocarbon for four hours or longer, without clinical signs of respiratory distress; (3) liquid respiration prevented dependent pulmonary arteriovenous shunting at +6 Gy; (4) vertical gradients in pleural pressure gradients were approximately 0.7 cm H2O/cm vertical distance between pleural catheter tips in air breathing dogs in contrast to greater than 1.0 cm H2O/cm vertical distance in liquid breathing experiments; and (5) liquid breathing prevented inertial displacements of the heart and other mediastinal structures to dependent sites in the thorax, and roentgenographically evident pulmonary atelectasis in dependent regions. Author

N71-20359# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

AGE AND EXERCISE AS FACTORS INFLUENCING OSTEOPOROSIS, BONE STRENGTH, AND ACCELERATION TOLERANCE

L. E. Kazarian and H. E. Von Gierke *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 21 p refs (See N71-20351 09-04)
(AMRL-TR-70-74) Avail: NTIS

Spinal injury associated with escape from high performance aircraft has tended to occur more frequently in the aged than the younger aircrewman population. Although an age influence for this trauma has not been clearly demonstrated, it must be hypothesized. Osteoporosis is part of the normal aging process and accompanies most diseases affecting man. Disuse osteoporosis appears to be an exaggeration of the normal aging process. Mechanical stress, such as that produced by exercise and physical activity, is necessary for the retention of skeletal mass and may be a specific influence in controlling the adverse effects of osteoporosis. To produce a partial answer to the questions raised and their potential operational significance, 24 adult rhesus monkeys were subjected to 60 days of physical inactivity. The results show a decrease in spinal impact tolerance in terms of vertebral body fracture when experimentally produced osteoporotic primates were exposed to whole body longitudinal spinal impact. Histopathological examination at points of tendinous and ligamentous attachment show increased bone modeling activity. Author

N71-20360# Army Aeromedical Research Lab., Fort Rucker, Ala.

PROBLEMS OF ADAPTATION TO LONG RANGE LARGE SCALE AERIAL TROOP DEPLOYMENT

Stanley C. Knapp *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 14 p refs (See N71-20351 09-04)
Avail: NTIS

Stresses and adaptation problems demonstrated during large scale, long range, rapid reaction time, aerial troop deployments are described. NATO Exercise, REFORGER 1 and other recent large scale aerial troop deployments are discussed. Author

N71-20361# Texas Univ., Galveston. Dept. of Neurology and Psychiatry.

IMPULSIVENESS AND ANXIETY RELATED TO PERCEPTUAL MOTOR PERFORMANCE

Ernest S. Barratt and Gilbert Tolhurst (ONR, Arlington, Va.) *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 5 p refs (See N71-20351 09-04)
(Contract N00014-68-A-0105-0002)
Avail: NTIS

Anxiety and impulsiveness have been studied within a conceptual framework that recognizes four classes of variables: (1) everyday life experiences; (2) psychometric tests and psychometric interviews; (3) laboratory behavioral measures; and (4) psychophysiological measures. The overall goal was to describe anxiety and impulsiveness across all four classes of variables for both stress and nonstress conditions. Examples of the relationship of the interaction of impulsiveness and anxiety to perceptual motor

performance are presented within the context of a brief discussion of the overall research program. Author

N71-20362# Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.

EFFECTS ON HUMAN PERFORMANCE OF COMBINED ENVIRONMENTAL STRESSES

Walter F. Grether *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 10 p refs (See N71-20351 09-04)

Avail: NTIS

Research studies of environmental effects normally expose subjects to only one stress at a time, while in operational flying there are usually several stresses acting simultaneously. The possibility exists that effects of such combined stresses may be greater than would be predicted from single stress studies. There have been relatively few laboratory studies of human performance in which the subjects have been exposed to such combined stresses. A critical review is presented of these past studies from the particular viewpoint of whether performance decrements from combined stresses are more severe than would be predicted from single stress studies. Although the number of past studies is not sufficient to present a consistent or conclusive picture, they do suggest that combinations of environmental stresses do not present a special hazard in flying that could not be anticipated from results of single stress studies. Author

N71-20363# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

THE NOVEL TASK AS A MEASURE OF PERFORMANCE UNDER ENVIRONMENTAL STRESS

M. F. Allnutt *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 4 p refs (See N71-20351 09-04)

Avail: NTIS

Experiments were conducted to determine human performance on a complex reasoning test under the stresses of temperature and altitude. In the analysis of the data special attention was given to those situations in which the subjects' first acquaintance with the task was under the stress condition. The experimental work along with a discussion of the advantages and disadvantages of using a novel task to assess performance under environmental stress is briefly discussed. Author

N71-20364# Centre d'Enseignement et de Recherches de Medecine Aeronautique, Paris (France). Lab. Central de Biologie Aeronautique.

IS LABORATORY EXPERIMENTATION USEFUL FOR STUDYING HUMAN ADAPTATION TO UNINHABITABLE SENSORY ENVIRONMENTS? [L'EXPERIMENTATION EN LABORATOIRE EST-ELLE PERTINENTE POUR ETUDIER L'ADAPTATION DE L'HOMME AUX ENVIRONMENT SENSORIELS INHABITUELS]

Roger Angiboust *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 7 p In FRENCH; ENGLISH summary (See N71-20351 09-04)

Avail: NTIS

Two experiments were conducted to study the adaptation of voluntary subjects to a degraded sensorial environment. These experiments showed that: (1) The behavioral and physiological response to an unusual environment depends on the subjects' level of education and personal interest in the test. (2) Adaptation to an unusual environment can be modified by giving to the tested subjects psychoaneleptics which induce behavioral manifestations of inadaptation in subjects who had been so far free from them. In light of these experiments, it appears that, for the subject, the significant stimulus is not the physical one or the arrangement of physical stimuli which excites his senses, but the meaning which he gives to the overall experiment situation, and the way he feels it. The importance of the decrement of physical stimuli does not affect the behavioral manifestations of inadaptation. The same physical environment can be felt as a neutral, indifferent stimulus, or, on the contrary, as an aggressive, nociceptive stimulus. Author

N71-20365# Italian Air Force Psycho-Phsiological Inst., Naples.

THE PSYCHOTHERAPEUTIC METHOD IN AVIATION PSYCHIATRY IN THE TREATMENT OF SOME SYNDROMES OF A REACTIVE CHARACTER

L. Longo *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 10 p refs (See N71-20351 09-04)

Avail: NTIS

The usefulness, in aviation psychiatry, of psychotherapeutic treatment of some syndromes of a reactive character, is shown through the description of 7 cases synthetically reported in their most indicative constitutive elements and in the psychodynamic modality of the relative psychotherapeutic treatment. Stress was laid on the advantages that accrue from the fact of being able to carry out the therapy in the environment itself, and on the favorable implications that can derive from it both on the strictly clinical plane and on the more specific one of maintaining and regaining flight fitness. Author

N71-20366# Italian Air Force Aerospace Medical Center, Rome (Italy).

EXPERIMENTAL RESEARCH ON HEAT BALANCE OF ATHLETES OF VARIOUS SPECIALTIES, DURING MUSCULAR EXERCISE IN DIFFERENT THERMAL ENVIRONMENTS

Paolo Rota and Antonio Todaro (Accident Prevent. Natl. Agency Res. Center) *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 8 p refs (See N71-20351 09-04)

Avail: NTIS

Athletes trained to different muscular exercises (long distance runners and sprinters) carried out work tests under conditions of thermal neutrality and in hot environments. During the tests, physiological parameters were recorded (central and skin temperatures, sweat loss, oxygen intake, work load, etc.), in order to calculate heat balance. Based on accumulated data, the behavior of thermal regulation, in respect to the different athletic specialties of the subjects tested, is discussed. Author

N71-20367# Army Medical Research and Nutrition Lab., Denver, Colo. Bioenergetics Div.

ENERGY METABOLISM DURING EXPOSURE TO EXTREME ENVIRONMENTS

C. F. Consolazio, H. L. Johnson, and H. J. Krywicki *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 11 p refs (See N71-20351 09-04)

Avail: NTIS

The energy requirements in a cold environment are practically unchanged as compared to a temperate environment, except for the 2 to 5% increase due to the wearing of the heavy clothes and footgear, providing that the individual is adequately clothed. However, the daily energy requirements for men living and working in a hot environment are increased. This is related to the increased requirement of the circulation in heat transport, the increased action of the sweat glands, increased caloric loss due to sweat vaporization and to the increase in body temperature. Balance studies including losses of nutrient in sweat indicate that these excretions are appreciable under conditions of profuse sweating. In the past, with the exception of sodium, very few investigators have recognized the fact that the mineral losses in sweat could be appreciable. The total mineral loss should include the mineral loss in sweat. This in turn would help in estimating more realistically the minimal daily allowances of minerals. Author

N71-20368# Army Medical Research and Nutrition Lab., Denver, Colo. Bioenergetics Div.

METABOLIC IMBALANCES AND BODY HYPOHYDRATION DURING FOOD DEPRIVATION (10 DAYS)

C. F. Consolazio, H. L. Johnson, and H. J. Krzywicki *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 8 p refs (See N71-20351 09-04)

Avail: NTIS

During studies of 6 men who fasted completely for 10 days, significant metabolic stresses developed which could eventually lead to serious abnormalities. These observations included great body hypohydration resulting in large body weight losses, large nitrogen and mineral losses, and a marked ketosis. These findings are not unusual since both the body fat and protein stores must be utilized as energy sources. The maintenance of normal blood carbohydrate levels require a known quantity of protein breakdown. As a result, it was suggested that low anti-ketogenic diets and adequate mineral supplementation could prevent the marked ketosis, minimize protein catabolism, maintain fluid balance, and decrease the electrolyte excretion. EKG's and EEG's were normal in both groups during the entire study. It appears that restricted diets containing less than 500 calories/day are inadequate for short term performance. Although they spared water, the protein catabolism was still a major problem. Author

N71-20370# School of Aerospace Medicine, Brooks AFB, Tex. Environmental Systems Div.

EFFECT OF ACUTE AND CHRONIC EXPOSURE TO 21 mm Hg AMBIENT P SUB CO2 ON EXERCISE RESPONSE OF NORMAL MAN

R. D. Sinclair, J. M. Clark, and B. E. Welch *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 9 p refs (See N71-21351 09-04)

Avail: NTIS

Physiologic responses to the interacting stresses of exercise and hypercapnia were studied in 4 young male subjects who were well trained and in excellent physical condition. The subjects performed light, intermediate and heavy exercise on a bicycle ergometer whil breathing air and during acute (15-30 minutes) and chronic (15-20 days) exposure to an ambient P sub CO2 of 21 mm Hg. Simultaneous measurements of V sub E, V sub O2, V sub CO2, pulse rate, rectal temperature, and arterial P sub O2, P sub CO2 and pH were made at rest and from the 12th-15th minute of steady state exercise in the supine P sub O2 position. Increases in V sub E, V sub O2 and V sub CO2 were linear in response to increasing work load for all experimental conditions, but the average magnitudes of these parameters at similar work loads were essentially equal in acute and chronic hypercapnia. At each work load average V sub E was higher and average V sub CO2 was lower in hypercapnia than the corresponding values in air. Average V sub O2 and pulse rate varied little for the same work load in the different experimental conditions. The differences between mean arterial P sub CO2 during acute and chronic hypercapnia and arterial P sub CO2 during air breathing increased progressively with increasing work load. Decreases in arterial pH from resting control values were also progressive with increasing work load, but were similar in magnitude for the three experimental conditions owing to differences in metabolic acidoses. Author

N71-20371*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VOLITIONAL CONTROL OF VISUAL ACCOMMODATION

Robert J. Randle *In* AGARD Adaptation and Acclimatisation in Aerospace Med. Mar. 1971 13 p refs (See N71-20351 09-01)

(NASA-TM-X-66955) Avail: NTIS CSCL 06P

Research was conducted in an attempt to show that volitional control is possible in most individuals when feedback is provided which indicates to the subject his present accommodation level. The feedback was provided by modulating an audio-oscillator with the output of a servo-controlled infrared optometer which continuously monitored the refractive state of the subject's eye. Six young males with normal vision were trained to control their accommodation first using a tone and then without it. A specific task they learned was to accommodate toward 0 diopters when a 3-diopter checkerboard target was extinguished and they viewed a dark empty field. Their performance was compared against six untrained subjects on two dark empty field test tasks. The tasks were: (1) to maintain infinity focus while viewing a dark empty field for 3 minues; and (2) to go to infinity focus from a 3-diopter target when it was extinguished and a dark field ensued during a 3 minute period. A statistical analysis of the results showed that the trained group made significant reductions in their dark field myopia under these conditions, but the untrained subjects did not. Author

N71-20489*# Oak Ridge National Lab., Tenn. Neutron Physics Div.

THE ABSORBED DOSE AND DOSE EQUIVALENT FROM NEUTRONS IN THE ENERGY RANGE 60 TO 3000 MeV AND PROTONS IN THE ENERGY RANGE 400 TO 3000 MeV

R. G. Alsmiller, Jr., T. W. Armstrong, and W. A. Coleman (Army Nucl. Defense Lab.) 15 Jul. 1970 63 p refs Submitted for publication Supercedes N70-36818

(NASA Order H-38280A)

(NASA-CR-117314; ORNL-TM-2924-Rev) Avail: NTIS CSCL 20H

Nucleon-meson cascade calculations were carried out for monoenergetic neutrons (60 to 3000 MeV) and protons (400 to 3000 MeV) normally incident on a semi-infinite slab of tissue 30-cm thick, and the absorbed dose and dose equivalent as a function of depth in the tissue are presented. The calculated absorbed doses from 180- and 525-MeV incident neutrons and 660- and 730-MeV protons are compared with experimental data. For 525-MeV incident neutrons, the experimental and calculated absorbed doses are in good agreement, but this is not the case with the other comparisons. Author

N71-20493*# Techtran Corp., Glen Burnie, Md.

PROBLEMS OF SPACE BIOLOGY. VOLUME 11: THE TOXICOLOGY OF PRODUCTS OF VITAL ACTIVITY AND THEIR IMPORTANCE IN THE FORMATION OF ARTIFICIAL ATMOSPHERES OF HERMETICALLY SEALED CHAMBERS

V. V. Kustov et al Washington NASA Mar. 1971 156 p refs Transl. into ENGLISH of the publ. 'Problemy Kosmicheskoy Biologii. Tom 11: Toksikologiya Produktov Zhiznedeyatelnosti i Ikh Znacheniye v Formirovanii Iskusstvennoy Atmosfery Germetizirovannykh Pomeshcheniy' Moscow, Nauka Press, 1969 p 1-129

(Contract NASw-2037)

(NASA-TT-F-634) Avail: NTIS CSCL 06B

The formation of the gaseous products of vital activity is studied. Analyses of feces, urine, sweat, expired air and intestinal gases, the formation of harmful substances by the processes of decomposition of these products, and the effects of such products on experimental animals and humans are described. Formation of gaseous products of vital activity during normal metabolism is outlined. The specific problem of composition and hygienic significance of the gaseous substances accumulated beneath the clothing is discussed in detail. Chemicals to retard formation of harmful or nauseating gaseous products are discussed and their relative merits compared. Principles of establishing the permissible limits of concentration (PLC) of such products of vital activity as carbon dioxide, carbon monoxide, and hydrogen sulfide are contrasted with methods of establishing the PLC for industrial working environments. Author

N71-20546# California Univ., Davis. Radiobiology Lab.

[RADIOISOTOPE UPTAKE BY BEAGLE DOGS] Annual

Report, 1970
Jun. 1970 121 p refs
(Contract AT(04-3)-472)
(UCD-472-117) Avail: NTIS

Collected abstracts contained in the annual report deal with radioactive isotope uptake in Beagle dogs and its effect on dog mortality, reproduction, morphology, and pathology. Radiation dosage rates and body burdens are emphasized. G.G.

N71-20603# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PROCESSING OF VISUAL IMAGERY BY AN ADAPTIVE MODEL OF THE VISUAL SYSTEM: ITS PERFORMANCE AND ITS SIGNIFICANCE Final Report, Jun. 1969 – Mar. 1970
Oliver H. Tallman, II Nov. 1970 51 p refs
(AD-717157; AMRL-TR-70-45) Avail: NTIS CSCL 6/4

From a review of biological evidence and assumptions in the human visual system, a model is derived for the recognition of visual patterns. The abstraction of information under a smearing transformation by adaptive spatial filtering suggests a useful redefinition of the classical pattern recognition approach involving the extraction of distinct features or properties on a feature space. The digital simulation of the model for pattern recognition is described, and the performance of the model on a variety of tasks is reported. The scope of this simulation is thought to exceed that for any single pattern recognition model reported elsewhere. The significance of the performance of the model to several Air Force problems is discussed, and recommendations for continued investigations are suggested. Author (GRA)

N71-20604# Melpar, Inc., Falls Church, Va.
UNIVERSAL AIRCRAFT FLIGHT SIMULATOR/TRAINER SYSTEM DEFINITION Final Technical Report, Oct. 1969 – Sep. 1970
John E. Conant et al Sep. 1970 265 p refs
(Contract F33657-70-C-0451)
(AD-717179; Rept-9248-FR; ASD-TR-70-28) Avail: NTIS CSCL 5/9

In the definition study of the Universal Aircraft Flight Simulator/Trainer (UAFS/T), the total performance requirement and general configuration thereof are identified and described. The personnel, training, and facilities required to support, maintain, and house the UAFS/T are identified and described. The requirements for documentation in support of maintenance and operation of the UAFS/T are identified and described. Through an extensive review of the literature, a study is made of the physiology of the human vestibular and visual systems and quantitative values are determined for the desirable cockpit motion system, visual display system, and simulated instrument performance characteristics. Test reports on actual aircraft performance and an analysis of the expected advancement in these aircraft performances in the next 10 years are studied and quantitative values are determined for the desirable cockpit motion system, visual display system, and simulated instrument performance characteristics. These desirable performance characteristics are evaluated against present-day state-of-the-art mathematical modeling, digital computation systems, cockpit motion system concepts, and visual image generation and display techniques to determine and completely describe the recommended Performance Specifications for the UAFS/T. Author (GRA)

N71-20612# Atomic Energy Commission, New York.
HEALTH AND SAFETY LABORATORY FALLOUT PROGRAM, APPENDIX Quarterly Summary Report, 1 Jun. 1 Sep. 1970
1 Oct. 1970 400 p
(HASL-237-App) Avail: NTIS HC $6.00/MF $0.95

Data from monitoring activities around the world are presented in tabular form. These data include: monthly deposition of Sr-89 and Sr-90 at world land sites, radiostrontium deposition at Atlantic Ocean weather stations, radionuclides in surface air over selected terrestrial and marine sites, and radiostrontium in milk and tap water in New York. Tables containing the conversion factors used in presenting the data and half-life values for the radionuclides of interest in the program are included. Author

N71-20615# Massachusetts General Hospital, Boston.
POSITRON SCANNING WITH COMPUTER INTERFACE Technical Progress Report, 1 Jan. 31 Oct. 1970
10 Nov. 1970 20 p refs
(Contract AT(30-1)-3937)
(NYO-3937-2) Avail: NTIS

The development of techniques and equipment for use in studies of pulmonary physiology and blood flow in other organs using positron cameras for scanning the short-lived cyclotron-produced radioisotopes C-11, N-13, and O-15 is reported. Emphasis was placed on the use of O-15 in the form of O2, CO, and CO2. A positron camera using two detector banks, each containing 127 crystals and 72 photomultiplier tubes, was developed for obtaining rapid sequential images. A computer data analysis system was developed for use with a hybrid scanner for brain tumor localization. The cyclotron production of O-15 by the N-14(d,n) O-15 reaction, N-13 by the C-12(d,n)N-13 reaction, and C-11 by the B-10(d,n)C-11 reaction is reported. Methods for the incorporation of O-15 in CO2, CO, H2O, and erythrocytes are described. Author

N71-20628# Naval Aerospace Medical Inst., Pensacola, Fla. Naval Aerospace Medical Research Lab.
THE EFFECT OF EARPLUGS ON PASSENGER SPEECH RECEPTION IN ROTARY-WING AIRCRAFT
Carl E. Williams, John R. Forstall, and Ward C. Parsons 27 Oct. 1970 14 p refs
(AD-716768; NAMRL-1121) Avail: NTIS CSCL 6/17

Direct person-to-person speech communication is sometimes required in rotary-wing aircraft where high levels of noise make the use of hearing protective devices desirable. The question arises as to what effect earplugs would have on the intelligibility of speech in rotary-wing aircraft. Intelligibility test data obtained in flight as well as in a simulated flight situation indicate that the use of earplugs in rotary-wing aircraft will improve the reception of direct person-to-person speech communication. Moreover, their use will afford protection against the deafening, fatigue, and annoyance effects of the hazardous noise present in rotary-wing aircraft. Author (GRA)

N71-20629# Naval Research Lab., Washington, D.C.
STABILITY OF THE MOLECULAR SIEVE STRUCTURE IN HOSTILE ENVIRONMENTS Final Report
E. T. Johnson, D. D. Williams, and R. R. Miller 7 Dec. 1970 12 p refs
(AD-716748; NRL-7201) Avail: NTIS CSCL 6/11

Proposals for the use of molecular sieves as regenerable CO2 and/or H2O absorbers in closed spaces have usually been based on their demonstrated efficiencies in pure atmospheres. The previously unknown effect of thermal cycling in more hostile environments containing a nominally stable halogenated hydrocarbon has been investigated. While the test halocarbon (dichlorodifluoromethane) was not itself deleterious, the acid products resulting from the molecular sieve-promoted decomposition of the compound caused structural damage to the sieves, which severely affected their capacities for CO2 and H2O. Sieves of the 5A and 10A type were investigated under a variety of conditions, with the 5A sieve being the more resistant to damage. Author (GRA)

N71-20683# Central Inst. for Industrial Research, Blindern (Norway).
TELEMETRIC MEASURING TECHNIQUES IN BIOMEDICAL RESEARCH [TELEMETRISK MAELETEKNIKK FOR BL.A. BIOMEDISINSK FORSKNING]
Jul. 1969 39 p refs In NORWEGIAN; ENGLISH summary
(SI-Publ-619) Avail: NTIS

A brief survey of modulation and signal treatment, the main principles for telemetric measuring equipment for use in the biomedical field, and the available equipment is made. Author (ESRO)

N71-20698*# AiResearch Mfg. Co., Los Angeles, Calif.
STUDY OF MAN PULLING A CART ON THE MOON
A. Camacho, W. Robertson, and A. Walther Washington NASA Mar. 1971 124 p refs
(Contract NAS1-7053)
(NASA-CR-1697) Avail: NTIS CSCL 05H

The results are presented of a study made to evaluate the metabolic cost of self-locomotion in simulated lunar gravity using an EX-IA suit. The use of a cart as a load-carrying device was also evaluated. The tests were performed in a simulator using a blow-by piston suspension system. The effects of surface grades, surface characteristics, backpack weights, and cart weights on metabolic cost for various locomotive rates were determined. The range of surface characteristics investigated had only a small effect on the metabolic costs of locomotion. Pulling a cart weighing 165 pounds, earth weight, on a level surface did not increase the energy cost of locomotion over that obtained without the cart. Author

N71-20699# Southampton Univ. (England). Inst. of Sound and Vibration Research.
STARTLE DUE TO SONIC BOOM: STATEMENT OF THE PROBLEM
C. G. Rice and D. N. May Oct. 1969 45 p refs
(ISVR-TR-25) Avail: NTIS

This survey investigates the possibility that the sonic boom causes startle, inducing involuntary muscle contraction which combined with its mental impact precipitates accidents, disturbs sleep, impairs work performance, and damages health. The subject appears to be little researched; and it is suggested that if the real life effects of the boom are to be better understood, more work is needed in all these areas, particularly with regard to threshold effects and properties of the boom that cause startle, and to particular subgroups of the community whose reactions indicate disturbance. Author (ESRO)

N71-20718* Weber Aircraft Corp., Burbank, Calif.
DEVICE FOR SEPARATING OCCUPANT FROM AN EJECTION SEAT Patent
Earl W. Mussett, inventor (to NASA) Issued 5 Dec. 1967 (Filed 6 Jan. 1966) 8 p Cl. 244-122 Sponsored by NASA
(NASA-Case-XMS-04625; US-Patent-3,356,320;
US-Patent-Appl-SN-519161) Avail: US Patent Office CSCL 06G

Upon ejection from the vehicle, a lanyard attached to the vehicle releases a firing pin spring whereby the firing pin ignites an explosive charge which drives a piston and associated mechanical linkage to release tie-down devices which secure the occupant to the seat. Gases from the charge subsequently ignite a second explosive charge which drives the piston of a thruster device attached to one end of an ejection strap which lies between the occupant and the seat. The strap is snapped taut by the thruster action and forcibly separates the occupant from the seat structure. Official Gazette of the U.S. Patent Office

N71-20728# Texas Univ., Houston. Graduate School of Biomedical Sciences.
THE EFFECT OF RADIATION SENSITIVE MUTATIONS AND RADIATION ON RECOMBINATION IN PARTIALLY DIPLOID DERIVATIVES OF ESCHERICHIA COLI Progress Report
15 Sep. 1970 5 p
(Contract AT(40-1)-4024)
(ORO-4024-1) Avail: NTIS

Recombination was studied in diploids which carried two copies of the histidine operon with various mutational compositions. The purpose of the study was to introduce mutations effecting the dark repair system into partially siploid strains which contain mutations that are being converted or lost in the reciprocal products during recombinational events and to determine the effect of these ultraviolet-sensitive mutations on the frequency of gene conversion. Partially diploid derivatives containing the uvrA mutation were constructed and their genotypes are tabulated. A table is presented to show analysis of recombinants resulting from a limited number of spontaneous events occurring in the uvrA mutation. NSA

N71-20729# DuPont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
DEUTERATION IN SLOW NEUTRON RADIOGRAPHY OF BIOLOGICAL MEDIA
P. B. Parks, S. M. Reichard (Med. Coll. of Ga.), and M. Brown (Med. Coll. of Ga.) Jul. 1970 21 p refs
(Contract AT(07-2)-1)
(DP-1229) Avail: NTIS

Contrasts in slow neutron radiography of biological media can be improved by replacing hydrogen with deuterium in various tissues. Muscle and bone exposed to D2O readily exchange hydrogen for deuterium. If fully deuterated, their linear attenuation coefficients are reduced from approximately 3.4 and 2.3/cm to 0.5 and 0.5/cm, respectively. Fatty tissues, however, have little tendency to deuterate, and the linear attenuation coefficients remain approximately 3.5/cm. Slow neutron radiographs of deuterated-biological specimens show the fat distribution with contrasts exceeding those of conventional roentgenography. Calculations show that with a 50 to 70% hydrogen-deuterium exchange, slow neutron radiography of specimens as thick as the adult human arm or leg could be done without excessive radiation dose. However, clinical application of this technique cannot be recommended at this time because of the toxic effects of D2O. Author (NSA)

N71-20735# Stanford Univ., Calif. Electronics Labs.
SYNEURISTOR: A DEVICE AND CONCEPT
Manjula Bhushan Waldron Jan. 1971 118 p refs
(Contract N00014-67-A-0112-0044)
(AD-716821; SU-SEL-70-062; TR-6560-22) Avail: NTIS CSCL 6/4

The report develops a new kind of device called a syneuristor (after synaptic neuristor). A syneuristor is defined by six properties. These properties are shown to be sufficient to build complex automata. A circuit is proposed which is capable of realizing the properties of a syneuristor. In developing the electronic circuits, the possibility of integrating them is kept in mind. An electronic syneuristor is shown to find immediate use in all electronic robots, while realization through ionic propagation appears to hold a great potential in using them in biological systems. A brief introduction brings together the existing knowledge in this direction along with the motivation which led the author to propose a syneuristor. A comprehensive treatment is given to the application of the syneuristor in system synthesis. In particular, the syneuristor is shown to be able to model biological synapse and therefore can find use in modelling some biological systems. The syneuristor can generate a complete logic system of its own. Author (GRA)

N71-20777# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

EVENTUAL WHOLE BODY EXPOSURE RATE FROM Kr 85 RELEASED TO THE ATMOSPHERE

M. M. Hendrickson 13 Jul. 1970 16 p refs Presented at Symp. on Environ. Aspects of Nucl. Power Stations, New York

(Contract AT(45-1)-1830)

(BNWL-SA-3233; CONF-700810-52) Avail: NTIS

The whole-body exposure rate for man was calculated for immersion in Kr-85 dispersed in the atmosphere. Both gamma rays and Bremsstrahlung were accounted for. Immersion exposure for one year to a semi-infinite cloud of Kr-85 with an activity concentration of 3 × 10 to the minus seventh power muCi/cu cm would result in a calculated dose of 7 millirem to the whole-body and 300 m rem to the skin (7 mg/sq cm depth). In numerous instances the above concentration has been equated to a whole-body exposure rate of 500 millirem per year when in fact this is the exposure rate of the surface of the body. Using currently popular estimates of the growth of nuclear power production, release of Kr-85 into the atmosphere could conceivably cause a total body dose (or genetically significant dose) of about 0.03 millirem in the year 2000. NSA

N71-20778# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.

COLONIC TEMPERATURE RESPONSE TO OXYGEN AT HIGH PRESSURE Interim Report

Edward H. Dench, Jr. and George H. Kydd 2 Dec. 1970 28 p refs

(AD-716965; NADC-MR-7011) Avail: NTIS CSCL 6/19

The colonic temperature of two groups of rats identified as to source were measured during repeated exposure to oxygen at high pressure (OHP) and compared with animals exposed to air at high pressure or air at barometric pressure. When exposed to OHD 60 PSIG for 30 minute exposures, the temperature decreases rather sharply (0.04C/min.) but tends to approach a limit before the decompression starts. After a period during which it is constant, it begins to rise again during the decompression but has not reached the initial value in an hour. There is a poor correlation between the occurrence of convulsions and temperature. One group of animals showed some adaptation with respect to temperature after several exposures. Author (GRA)

N71-20796# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

COUNTING ACCELEROMETERS (AN ERROR ANALYSIS)

Gary F. Walker Aug. 1970 30 p refs

(AD-717151; ASD-TR-70-21) Avail: NTIS CSCL 1/3

Counting accelerometers are used on F/RF-4 aircraft as a part of the Aircraft Structural Integrity Program. The device counts and records the number of times four acceleration levels have been exceeded. The data are used with a fatigue analysis to determine fatigue damage on individual aircraft. The report presents the results of an error analysis of the counting accelerometer data and the fatigue analysis. Author (GRA)

N71-20797# Army Aviation Systems Command, St. Louis, Mo. Flight Standards and Qualification Directorate.

HUMAN FACTORS ENGINEERING MOCK-UP FACILITY

Charles E. Righter May 1970 25 p refs

(AD-717026; FS/Q-TR-70-4; USAA VCOM-TR-70-12) Avail: NTIS CSCL 5/5

The report is a brief study of the value of a mock-up facility as a management tool. Included is a general discussion for the need of this facility along with area and space requirements, skills and number of personnel required and a budgeting estimate. Also included is a proposed schedule for installation and completion of all areas. Author (GRA)

N71-20799# Southampton Univ. (England). Inst. of Sound and Vibration Research.

STARTLE DUE TO PISTOL SHOTS: EFFECTS ON CONTROL PRECISION PERFORMANCE

D. N. May and C. G. Rice Oct. 1969 70 p refs

(ISVR-TR-26) Avail: NTIS

The effect on control precision performance of startle due to 16 pistol shots of 124 dB peak level was investigated in the laboratory using 14 students and secretaries aged from 20 to 29. It was found that performance was significantly impaired in the two seconds following each bang and not thereafter, but that a lessening of reaction occurred and was reported over the length of the experiment. Some evidence was found for the existence of a critical interval between presentations which was thought to mark the longest period for which subjects in a given situation maintain their expectancy. Evidence was also found that subjects who learn slowly attain low levels of proficiency that are less affected by bangs than the higher levels of proficiency of subjects who learn quickly. Author (ESRO)

N71-20951*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PRELIMINARY RESULTS FROM AN OPERATIONAL 90-DAY MANNED TEST OF A REGENERATIVE LIFE SUPPORT SYSTEM

Albin O. Pearson and David C. Grana, comps. Washington 1971 579 p refs A symp. held in Hampton, Va., 17–18 Nov. 1970

(NASA-SP-261) Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Various study results from a 90-day manned test of a regenerative life support system in a space station simulator are reported. Operational performances of the integrated food-, water-, waste-, and atmospheric subsystems are emphasized and medical and psychological support criteria are described. For individual titles see: N71-20952 through N71-20999.

N71-20952*# National Aeronautics and Space Administration, Washington, D.C.

RATIONALE FOR INTEGRATED LIFE SUPPORT SYSTEMS

Walton L. Jones *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 1–3 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The status of life support research in space simulations is outlined and the application of results from a successful 90-day manned test of a regenerative life support system to space support missions in the 1980 to 1985 time period is projected. The need for automatic control, modular configuration, and the usefulness of larger crews and longer ground simulation tests is pointed out. G.G.

N71-20953*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

TEST OBJECTIVES AND PROGRAM MANAGEMENT

J. K. Jackson *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 5–15 refs (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Objectives of the 90-day operational manned test involved the evaluation of an advanced regenerative life support system similar to that of an orbiting scientific laboratory under closed door conditions. These objectives included determinations of long term operating characteristics and power requirements of individual sybsystems and the total system; measurements of mass and thermal balances; determination of the ability of the test crew to operate, maintain, and repair onboard equipment; measurements of chemical and microbial equilibria of the closed ecological system; assessment of the effect of confinement on the psychological and

physiological characteristics of the test crew; and collection of data to assist in determining the precise role of man in performing in-flight experiments. Author

N71-20954*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
FACILITY SUPPORT SYSTEMS
J. P. Valinsky, R. L. Malin, and N. R. Radke *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 17-33 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The facility for a 90-day manned test of a regenerative life support system is described including the support systems which were assembled to satisfy the program objectives and the safety requirements. Specific systems and equipment that are included are: the Space Station Simulator (SSS) chamber, the heating and cooling heat transfer loops, the electrical power system, the vacuum and freeze trap systems, the gas analysis system, the communications system, and the data system. The supporting laboratories which included microbiological, water analysis, and medical, are described and their effectiveness is discussed. Author

N71-20955*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
LIFE SUPPORT SYSTEMS
J. K. Jackson *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 35-41 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The interior of the space station simulator was redesigned to provide an equipment room and a crew living area separated by an acoustic barrier. The life support equipment, operating instrumentation, and controls were located in the equipment room. Extensive provisions were made for acoustical control. The life support equipment included advanced units which were being operated for the first time in a manned test and baseline equipment which was available from the previously completed 60-day test. Integration of these units in such a manner that failure of a single unit did not jeopardize other test objectives was a major task of the systems engineers. The life support system included units for water management, thermal and humidity control, atmosphere purification, atmosphere supply and pressure control, waste management, and food management. Author

N71-20956*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
WATER MANAGEMENT
D. F. Putnam, E. C. Thomas, and G. V. Colombo *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 43-90 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Water management subsystems used in the 90-day test were: (1) isotope heated VD-VF unit; (2) wick evaporator and humidity control unit; (3) detoxification-multifiltration unit; (4) potable water storage and distribution system; (5) backup potable water supply; and (6) wash water recovery unit. The performance data include mass and energy balances, water chemistry, and microbiological profiles. Pretest qualification procedures are covered as well as operating procedures used during the manned test. Author

N71-20957*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
DESIGN AND DEVELOPMENT OF THE VACUUM DISTILLATION, VAPOR FILTERED, ISOTOPIC FUELED WATER RECOVERY SYSTEM FOR THE 90-DAY MANNED SIMULATOR TEST
Courtney A. Metzger *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 91-97 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The water recovery system for the 90-day manned simulator test is designed to recover potable water from pretreated urine and humidity condensate. This system uses radioisotopes for thermal energy and is based on vacuum distillation, vapor filtration, and catalytic oxidation of the contaminants in the vapor. The design and development of the system are described. Author

N71-20958*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
PERFORMANCE EVALUATION OF THE THERMAL CONDITIONING UNIT
G. E. Allen *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 99-106 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The configuration and performance of a thermal conditioning unit used during the 90-day manned test is presented. High reliability was realized throughout the 90 days and no failures required maintenance. Areas of improvement in the basic design concepts have been indicated, based on experience gained during the test, which would improve the operation and efficiency of the thermal conditioning unit. Recommendations are offered which will considerably lower the power required, the quantity of primary atmosphere circulated, and the associated noise level of the unit in addition to providing individual compartment temperature control. Author

N71-20959*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
PERFORMANCE OF THE CO2 CONCENTRATORS
E. S. Mills and T. J. Linzey *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 107-115 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The CO2 concentrator system consisting of the advanced baseline solid amine system, the backup molecular sieve system, and the emergency lithium hydroxide-Gemini CO2 removal unit performed satisfactory. The average CO2 concentration in the cabin over the 90-day test time averaged approximately 5 mm Hg rather than the intended 4 mm Hg, primarily because of the problems with adjusting the solid amine concentrator. The solid amine unit was used for CO2 control during the majority of the first 81 days of the test. When adjusted correctly, with the proper water balance in the beds, the unit maintained the CO2 cabin concentration at the specified level. The performance of the molecular sieve CO2 concentrator was satisfactory, serving the role of backup when needed. Author

N71-20960*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
OPERATIONAL CHARACTERISTICS OF THE INTEGRATED SABATIER/TOXIN BURNER UNIT
J. F. Harkee *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 117-129 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Operation of the Sabatier reactor during the initial 30 days of the 90-day manned test was somewhat complicated by catalyst poisoning caused by trace quantities of Freon-113 (TF) appearing in the carbon dioxide. Operation returned to normal after replacing the catalyst and adding a charcoal trap to remove the contaminant from the carbon dioxide. The Sabatier unit produced about 350 lb of water during the test. The average water production rate for the last 60 days was 4.38 lb/day. The reactor converted over 95 percent of the hydrogen processed to water. The toxin burner operated normally throughout the test. Author

N71-20961*# Hamilton Standard, Windsor Locks, Conn.
PERFORMANCE OF A SOLID-AMINE CARBON DIOXIDE CONCENTRATOR DURING A 90-DAY MANNED TEST
Harlan F. Brose and Rex B. Martin (NASA. Langley Res. Center) *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 131-143 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

A carbon dioxide concentration system which utilized a regenerable amine absorbent was used in the 90-day manned test. The system design provided for limited automatic operation with manned override capability. The successful operation of the unit during the 90-day test establishes solid amine as a feasible CO2 absorbent with certain advantages over a molecular sieve CO2 control system. The principal advantages demonstrated in the 90-day test are the ability of the sorbent material to operate with humid influent gas, with good performance at low CO2 pressures, and with the ability to desorb CO2 at ambient pressure and higher. Author

N71-20962*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
ANALYSIS OF TRACE CONTAMINANTS
P. P. Mader and J. K. Jackson *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 145-158 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

During the 90-day operation of the Space Station Simulator (SSS) and the short duration manned and unmanned test runs which preceded it, analytical support was provided by determining the composition and daily fluctuations of trace contaminants. Analysis of atmospheric samples for the presence of trace contaminants was done by chromatograph on direct samples and concentrated samples obtained by freeze-out techniques to determine the presence of organic compounds. The direct samples indicated the presence of as many as nine organic contaminants although none were present at levels approaching critical values. Inorganic compounds were measured by wet chemical analyses on daily samples; compounds detected included total aldehydes and ammonia during some periods. Tests run on CO2 removed from the cabin by the molecular sieve and solid amine units indicated increased concentration of Freon TF. Tests on catalyst from the Sabatier reactor and a white powder found at the outlet of the toxin burner indicated heavy concentrations of halogens. Author

N71-20963*# Aerojet Electrosystems Co., Azusa, Calif. Analytical Research Labs.
MEASUREMENT OF TRACE ATMOSPHERIC CONSTITUENTS IN THE 90-DAY SPACE STATION SIMULATOR
M. L. Moberg and C. L. Deuel *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 159-177 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Analytical data and methods of collecting trace atmospheric components found during the 90-day manned space chamber test are reviewed. The three collection methods and special sampler used on this program provided samples for measuring the major, minor, and trace components with classical gas volumetric analytical precision throughout the dynamic range and with reasonable turnaround time. Approximately 100 components were identified and quantitatively measured using gas chromatography, mass spectrometry, infrared spectrophotometry, and high-vacuum rack manipulation. With relatively few exceptions the Space Station Simulator atmosphere was found to be of higher quality than the average troposphere. Author

N71-20964*# Transportation Systems Center, Cambridge, Mass.
RESULTS OF THE AEROSOL ANALYSIS EXPERIMENT PERFORMED DURING A 90-DAY MANNED TEST OF AN ADVANCED REGENERATIVE LIFE SUPPORT SYSTEM
Walter F. Harriott and Robert A. Walter *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 179-187 Supported in part by OART and by NASA (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Preliminary results from the aerosol analysis experiment are presented. The membrane filter data indicate the trend of particulate concentration in the simulator. The filters have also been partially analyzed by scanning electron microscopy for particle type. Close correlation in particle production has been found between submicrometer and micrometer particles and the particle producing activities within the simulator. Author

N71-20965*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
WATER ELECTROLYSIS SYSTEMS
E. S. Mills *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 189-202 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Three different water electrolysis units were used during the 90-day test of a regenerative life support system. A commercial unit was used for backup to two experimental units. One experimental unit uses a vapor feed and intermittent circulation of electrolyte and was installed inside the space station simulator. The other unit uses a liquid feed with continuous electrolyte circulation and was installed outside the chamber. All three units operated with some degree of success during the test period. The experimental units provided 71.6 percent of the total hydrogen required and 68.3 percent of the total oxygen required. All units experienced failures. Some of these failures caused early shutdowns due to inaccessibility and lack of proper parts; other failures were repairable because the unit was outside the chamber. Author

N71-20966*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
OPERATIONAL CHARACTERISTICS OF A TWO GAS CONTROLLER
J. F. Harkee *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 203-208 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

A system for controlling and metering the supply of atmospheric gases to the space station simulator during the recent 90-day manned test functioned successfully. A four-gas mass spectrometer was utilized to generate the control signals to the atmospheric controller. The controller added 862 lb of oxygen and 279 lb of nitrogen to the space station simulator during the test.

During most of the test, the oxygen partial pressure was controlled within + or − 0.5 mm Hg of the control setpoint and the nitrogen partial pressure within + or − 8 mm Hg. The reduced accuracy of the nitrogen channel was apparently due to the higher than predicted cabin leakage associated with a low control loop gain, and can be improved by simple design modifications. Author

N71-20967*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
LOCKHEED ELECTROLYSIS SYSTEM FOR THE 90-DAY MANNED TEST
Thomas M. Olcott and Barbara M. Greenough *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 209 219 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The electrolysis system for the ninety day test was designed as a back-up system to operate either inside or outside the space station simulator. The system provides oxygen automatically on demand at a design rate of 8.0 lb/day. Startup and shutdown of the system can be accomplished quite rapidly and are manual operations except for the automatic safety shutdown. Safety status indicators are provided on the front panel for performance monitoring. Author

N71-20968*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Systems Div.
EVALUATION OF A FOUR-GAS MASS SPECTROMETER USED FOR ATMOSPHERIC CONTROL DURING THE 90-DAY TEST
Michael R. Ruecker *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 221 - 244 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The design and performance of a mass spectrometer atmospheric sensor system which was utilized for monitoring and control of the atmosphere of a manned space station simulator during a 90 day test is reviewed. The instrument operated with a new closed loop electronics control system for improved long term stability. Based upon calibration verification data taken during the 5-day and 90-day runs, the instrument was demonstrated to hold its calibration within 1% for nitrogen, 2% for oxygen, and 3% for carbon dioxide for a period of 132 days. It also monitored water vapor partial pressure. The output signal from the oxygen channel was employed by an atmosphere control system for maintaining the oxygen partial pressure of the space station simulator. The instrument demonstrated its ability to perform reliably. Author

N71-20969*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
DESIGN AND OPERATION OF A WASTE MANAGEMENT SYSTEM FOR FECAL COLLECTION AND SAMPLING DURING THE 90-DAY MANNED SIMULATOR TEST
Courtney A. Metzger *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 245 250 refs (See N71-20952 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

A component designed for the collection, processing, and storage of feces and toilet tissue aboard aerospace vehicles has been fabricated and successfully tested. This system extends the useful life of a prior design by use of a replaceable liner assembly (liner, slinger, motor, and filter), sized for approximately 200 man-days accumulation. The filter prevents contamination of all downstream lines and permits changing of the liner without contamination of the cabin. Other features of the unit are a quick acting slide-valve assembly, a fecal sampler, and a disinfectant dispenser. Author

N71-20970*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
WASTE MANAGEMENT SUBSYSTEM
J. K. Jackson and R. E. Shook *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 251 - 258 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The waste management subsystem included the commode, urine collector, and urine phase separator. The urine collector was an Apollo type with built-in flush water injector. The urine phase separator included automatic pretreatment injection. Operation and crew acceptance of all units were generally adequate except the urine phase separator, in which the polyurethane impeller was dissolved early in the test by an accidental injection of concentrated pretreatment solution. Subsequent use of the urine collection system required the use of gravitational forces for phase separation. The commode required liner replacement once during the mission, on day 44, and was used 319 times. Author

N71-20971*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
FOOD MANAGEMENT PROGRAM
J. S. Seeman and D. J. Myers *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 259 - 267 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The food provisions available to onboard crewmen during the 90-day test consisted of a primary freeze dried menu, supplementary snacks, frozen dinners, glycerol (sweetener), and a small amount of ice cream. Packaging, storage accommodations, supporting equipment, and acceptability for the food supplies are discussed. Recommendations for food programs for future long-term space missions are provided. Author

N71-20972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
USE OF GLYCEROL AS A DIET SUPPLEMENT DURING A 90-DAY MANNED TEST
Jacob Shapira *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 269 - 275 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The crewmen during a ninety day manned test ingested a glycerol solution mixed with various other food materials during two different five day periods. The glycerol diet supplement was judged to be better than average and did not lead to an elevation in serum free glycerol. An erratic and inconsistent rise in urine-free glycerol, as determined by an enzymatic method, was observed. As expected, there was no nausea or ill effect observed during the use of free glycerol as a food adjunct. Author

N71-20973*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
MASS BALANCE DATA
J. K. Jackson, L. G. Barr, and J. F. Harkee *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 277 291 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

The overall mass balance data discussion for the 90-day test includes consideration of the potable water recovery, the wash water recovery, the atmosphere supply, and the atmosphere recovery units. From these data and other records, the crew input/output requirements are determined. Each of these areas is discussed in detail. Author

N71-20974*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

THERMAL BALANCE DATA

J. K. Jackson and G. E. Allen *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 293-300 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

Thermal conditioning of the Space Station Simulator (SSS) during the 90-day test was done by a cooling loop circulating Coolanol 35 at 32 to 40 F. Process heating fluid was also provided by a circulating loop using electrically heated Coolanol 35. This loop supplied the carbon dioxide concentrators: the solid amine unit at about 240 F and the molecular sieve unit at 320 F. Total heat removed from the chamber varied from 22,846 Btu/hr (6.695 kW) to 29,514 Btu/hr (8.650 kW), depending on operating mode of the life support units. This total does not include thermal control requirements for water electrolysis, because operating time on the unit was too short to reach equilibrium. Author

N71-20977*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

DEVELOPMENT OF CREW SELECTION GUIDELINES FOR THE 90-DAY MANNED TEST

Rayford T. Saucer *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 323-327 refs (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 05I

A panel or steering committee of behavioral scientists was created to advise operations personnel on selection methods for the crew. The panel, acting in an advisory capacity, made recommendations concerning crew selection, monitoring, and assessment. A generalized concept of crew selection for long duration missions was developed on the basis of motivation, skill levels, emotional maturity, and observations of group compatibility. Author

N71-20978*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

CREW SELECTION

J. S. Seeman and M. V. McLean *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 329-337 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 05I

The successful selection of crewmen for the 90-day manned test was a major contribution to the total study. A highly selected group of individuals was screened and evaluated for compliance with numerous criteria relating to their acceptability and ability to withstand isolation stresses. Results of the crew selection process indicate that crew selection was an important contributor to the overall success of the 90-day test. In addition, quantitative psychological criteria have been developed which can be employed on future studies of this nature. Certain limitations in the use of psychological testing techniques have been identified and the importance of pragmatic aspects of personnel selection has been demonstrated. Author

N71-20979*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

CREW TRAINING

R. E. Shook and J. S. Seeman *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 339-362 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 05I

The purpose of the crew training program was to prepare candidates for effective participation in the 90-day manned test. Curriculum coverage was accomplished over an approximate 6-month period and consisted of training in experiment operations, safety procedures, equipment operating procedures, and maintenance and data collection requirements. The training program contributed significantly to the success of the 90-day manned test insofar as it provided a well trained, highly motivated crew for integration with the operations required onboard the space station simulator. Author

N71-20980*# McDonnell Douglas Astronautics Co., Huntington, Calif.

BEHAVIORAL PROGRAM

J. S. Seeman and M. V. McLean *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 363-375 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06S

The behavioral program assessed effects of confinement on crew behavior in the areas of psychological status, sleep durations, and task performance. Psychological status and sleep durations were measured by objective questionnaires. Task performance information was obtained by TV monitoring of the onboard crew. Psychologically, the test was not severely stressful as expected, but periods of low morale and mild hostility were noted. Certain tests appear somewhat insensitive and are candidates for exclusion from future studies. More subtle or sensitive tests must be developed in their stead. Sleep durations were significantly shorter during the early part of mission for crewmen on inverted sleep cycle and adaptation did not occur until approximately the mid point in the test. Task performance information indicates a relatively poor use of the crew in terms of work performance. Author

N71-20981*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MANNED MISSION ACTIVITY ANALYSIS

Karen Brender and Edward R. Regis (McDonnell Douglas Astronaut. Co.) *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 377-391 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

The objectives of the mission activity analysis experiment on the 90-day test were to generate manual and computer schedules of planned crew activities for the purposes of: (1) evaluating the planning and scheduling capabilities of the space station simulation mathematical model; and (2) comparing crew performance data with manual and computer generated crew activity schedules. The experiment objectives were successfully accomplished. Crew event descriptions and scheduling activities acted as forcing functions for early identification of problem areas and operational constraints. The crew activity schedule provided direct and material support to the successful operations conducted during the test. Author

N71-20982*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

HABITABILITY

J. S. Seeman, R. V. Singer, and M. V. McLean *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned

Test of a Regenerative Life Support System 1971 p 393-414 (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

An overview is provided of the more outstanding findings regarding crew reaction to the environment afforded within the space station simulator during the 90-day confinement. Such areas as lighting, clothing, acoustic environment, and responses to the onboard habitability inventory are discussed. An examination of crew responses indicates that the environment adequately supported the habitability needs of the four crewmen. In those instances where difficulties were apparent, recommendations are offered for design alteration in future missions. Author

N71-20983*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PSYCHOMOTOR PERFORMANCE DURING THE 90-DAY MANNED TEST
Rayford T. Saucer, Patrick A. Gainer, and Grady V. Maraman *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 415-419 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

A psychomotor test device was placed aboard the 90-day test chamber. Subjects were tested four times daily. Data were analyzed for effects of confinement and for effects of selected trace gases. Long term effects were not found; however, short term relationships between the gas levels and the psychomotor performance were found to be small but significant. Author

N71-20984*# Systems Technology, Inc., Hawthorne, Calif.
CREW PERFORMANCE ON SIMULATED CONTROL TASKS
R. Wade Allen and Henry R. Jex *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 421-435 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

In order to test various components of a regenerative life support system and to obtain data on the physiological and psychological effects of long duration exposure to confinement in a space station atmosphere, four men were sealed in the space station simulator for 90 Days. A tracking test battery was administered during the above experiment. The battery included a clinical test related to the subject's dynamic time delay and a conventional steady tracking task during which dynamic responses and performance measures were obtained. The subjects were extensively trained prior to confinement and generally reached asymptotic performance levels. Good correlations were noted between the clinical critical instability scores and more detailed tracking parameters such as dynamic time delay and gain-crossover frequency. The chamber environment caused no significant decrement on the average crewman's dynamic response behavior, and the subjects continued to improve slightly in their tracking skills during the 90-day confinement period. Author

N71-20985*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF LONG DURATION CONFINEMENT ON SHORT-TERM MEMORY
R. Mark Patton and Clayton R. Coler *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 437-445 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05J

A short-term memory test device, the Response Analysis Tester (RATER) was used in the 90-day study. Two test conditions, delay and no delay, were used. The no-delay condition required that the subject respond to the symbol currently being presented, and no short-term memory was involved. The delay condition required the subject to respond according to the symbol that had been presented two stimulus events prior in the sequence. Since all responses had to be delayed by two symbols, short-term memory was required throughout this test condition. Since most of the subjects continued to show performance improvement over a large number of test sessions, and since asymptotic performance was desirable prior to confinement, 28 training sessions were specified for the 90-day study. A stimulus presentation rate of one symbol per second was selected. A two-symbol delay seemed to provide the desired level of difficulty for the short-term memory testing. Author

N71-20986*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
NON-INTERFERENCE PERFORMANCE ASSESSMENT (NIPA)
M. M. Okanes, W. R. Feeney, and J. S. Seeman *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 447-460 ref (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

One of the original goals of this program was to develop unobtrusive methods of obtaining social and emotional data from crewmen on the 90-day space station simulator test by visually and aurally observing behavior. The object was to avoid the resistance produced by intrusive measurement and its concomitant effect on the data being gathered. However, unobtrusive observation means that crewmen must be completely unaware of observations being made. This was not possible because of the policy of giving as much information as possible to the crewmen about all aspects of the program. Thus, this study is viewed as a test of methodology and not as a means for contributing substantively to theoretical constructs in individual or social psychology. Author

N71-20987*# California Univ., Los Angeles.
PSYCHOLOGICAL ASSESSMENT OF CONFINED CREWS
Barry E. Collins, Joan Ranere, and Alvan Rosenthal *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 461-469 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05J

The physical locations of the crewmen, their physical movements, and the task and affective aspects of their written communications were observed in order to identify and forecast problems in crew performance during long term confinement. Data from the 90-day space station simulation test suggest that boredom correlated positively with task loads and quality of diary transcriptions; the crew was at its best when the task load was heaviest. Transcript quality indices increased on days when the crew took long trips around the simulator by 0.09 to 0.34. G.G.

N71-20988*# Douglas Aircraft Co., Inc., Huntington Beach, Calif.
BEHAVIORAL ACOUSTICS: THE IMPACT OF SPACE SIMULATOR NOISE ON CREW MEMBERS
Lawrence E. Langdon, Richard F. Gabriel, and Paul A. Abell *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 471-478 refs (See N71-20951 10-05)
Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

A multi-faceted program was used to evaluate the effects of space station simulator background noise on the crew members. The main goal was to define limits for the background noise in future long duration missions. A 1/2-hour behavioral acoustics test battery was given for each crew member weekly. Repeated habitability questionnaires, a post test questionnaire on noise, and a noise debriefing were used to obtain crew reactions. The living quarters noise, approximately 64 db(A) was rated reasonably satisfactory. The equipment area noise, approximately 77 db(A) was

not well accepted, although crew members spent limited time in that area. Intermittent noises such as pumps and talking were rated as the worst noise problem, especially when trying to sleep. Specific recommendations based on these findings and assessment of the adequacy of the acoustics test program are provided. Author

N71-20989*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

EEG MONITORING/SLEEP STUDIES

R. D. Joseph, W. B. Martin, and S. S. Viglione *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 479-494 refs (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 05E

The 90-day test program provided for the acquisition and analysis of EEG and EOG recordings taken from 39 nights of sleep divided between two subjects. Approximately 350 hours of data were acquired and analyzed. An automatic scoring system was designed for each of the two subjects participating in the sleep studies. Six classifications are provided: awake, rapid eye movement (REM), and stages 1 through 4, as defined by the Association for the Psychophysiological Study of Sleep (APSS). In addition, movements and artifacts were also detected. Sleep behavior of the men deviated little during the 90-day run with some changes between days 60 and 70. In general, both crewmen had little slow wave activities, averaging 30 minutes per night for one man and 5 minutes per night for the other crewman. Author

N71-20990*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

MEDICAL PROGRAM

J. R. Wamsley and D. J. Myers *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 495-515 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06E

Medical procedures were planned to provide maximum data on crew medical status throughout the test within the constraints of limited pass-outs and onboard crew capabilities. These procedures and associated studies by outside investigators were accomplished without significant problems. Evaluation of the results confirm that the space station simulation environment was benign medically. Author

N71-20991*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

MICROBIOLOGY RESULTS: DERMAL AND ENVIRONMENTAL SAMPLING

K. J. Levinson *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 517-529 (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06M

The 90-day space station simulation test offered unique opportunities for obtaining long term microbiological data in an isolated environment. An illustration of the sampling protocol utilized for the microbiology program is presented. Skin sites were swabbed weekly to determine potential shifts in normal microflora. No significant quantitative alternations were found and there were no observable shifts in predominant isolates. Reynier air samples and surface swab samples were used to obtain microbial counts and identification of predominant types. The predominant organisms in both of these types of environmental samples remained those carried by the crew members. An increase in number of types but not in number of viable particles in atmospheric samples coincided with catalytic burner shutdown and may be coincidental and unrelated to that occurrence. Author

N71-20992*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NASOPHARYNGEAL STUDIES

Judd R. Wilkins *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 531-539 refs (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06E

Before and after the test and weekly during the test, nose and throat swabs from each crewman were cultured for Staphylococcus aureus, beta-hemolytic streptococci, Neisseria meningitidis, Diplococcus pneumoniae and Hemophilus influenzae. Beta-hemolytic streptococci were isolated from the throat of crewman 1 only on the fourth, 60th, and 67th days of the test. Neisseria meningitidis was recovered from the throat of crewman 3 during pretest sampling, throughout the 90-day test, and from posttest samples. This organism was also recovered from the throat of crewman 1 on the 25th and 32d days of the test. All four crewmen were healthy carriers of Diplococcus pneumoniae, and it was consistently isolated from the throat during the 90-day test. All attempts to recover Hemophilus influenzae failed, and no effort was made to culture this organism after the 53d day of the test. In the 90-day test there was no clinical illness related to the carriage or transfer of potentially pathogenic bacteria. Author

N71-20993*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CHEMILUMINESCENT BACTERIAL SENSOR

Judd R. Wilkins *In its* Prelim. Results from an Operational 90-Day Manned test of a Regenerative Life Support System 1971 p 541-545 ref (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF$0.95 CSCL 06M

The purpose of the chemiluminescent bacterial sensor experiment during the 90-day test was to determine: (1) if the sensor could rapidly detect gross contamination of recovered water; and (2) the correlation between sensor response and viable counts. The results showed good correlation between a strong sensor response and viable counts on eight occasions. In 60 tests the sensor response was strongly positive, and the plate counts were either negative or below the level of sensor sensitivity or were not performed. Because the sensor responds to living or dead cells, these results suggest that the recovered water may have contained: (1) dead bacterial cells; (2) porphyrins leached from cells; or (3) substances unrelated to bacteria which triggered a positive response. In general, the sensor was able to detect gross contamination rapidly, required minimum crew participation, and was easy to operate. Author

N71-20994*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

RADIATION SAFETY REPORT ON THE USE OF (Pu-238)-O2 AS A HEAT SOURCE

A. A. Kelton *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 547-563 refs (See N71-20951 10-05)

Avail: NTIS HC$6.00/MF $0.95 CSCL 06R

Heat from five capsules containing Pu(238)O2 in the form of microspheres was used to power a water recovery subsystem in the 90-day manned test of a regenerative life support system in a space station simulator. Despite 76 manipulations of capsules at a whole body dose rate of 25 mrem/hr and the existence of a radiation area in a regularly traversed area of the SSS, the average integral exposure for 90 days of confinement was only about 100 mrem, less than 10 percent of the normally allowed dose. No discernible damage was sustained by any of the capsules, and no release of radioactive contamination could be detected. Several improvements in devices and procedures for the radiological safety of radioisotope power applications in manned spacecraft were identified. These studies indicate that current tendencies toward excessive protective measures may be unnecessary. Author

N71-20995*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
BODY FLUID AND BODY COMPOSITION MEASUREMENTS
A. A. Kelton *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 565 -572 ref (See N71-20951 10-05)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06P

Measurements of plasma volume, blood volume, and total body water with radiopharmaceuticals, and also measurement of total body potassium by natural K-40 did not reveal any large changes in whole-body fluid compartments or lean body mass for the test or control subjects during the 90-day test in the space station simulator. Although the changes in body fluids and lean body mass were of marginal significance, the combined results are believed to reflect differences in the physical activity among the subjects. Author

N71-20996*# Naval Medical Research Inst., Bethesda, Md.
SOME BIOCHEMICAL DETERMINATIONS ON SERUM FROM CREWMEN PARTICIPATING IN A 90-DAY SPACE STATION SIMULATOR TEST
Edgar M. Neptune, Jr., Richard E. Danziger, Terry L. Sallee, and David E. Uddin *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 573 -581 refs (See N71-20951 10-05)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06P

Numerous alterations in the biochemical assays of serum were observed in the crewmen of the space station simulator during and after the 90-day test. These alterations are evaluated in relation to the mean pre-test values with each man serving as his own control. Although the test was judged to be totally benign by the medical staff, the biochemical alterations are tentatively attributed to either the exercise program or the psychological or other stress factors. Final interpretation must await evaluation of these data with the data obtained by other research groups involved in this study. Author

N71-20997*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
UTILIZATION OF THE V-V SPIROMETER LOOP TECHNIQUE FOR RESPIRATORY MONITORING
O. F. Trout, Jr., and T. O. Wilson *In its* Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 583 -590 refs (See N71-20951 10-05)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06P

The spirometer loop technique was successfully used in the 90-day manned test for respiratory monitoring. Only temporary small changes occurred in the respiratory systems of the test subjects during the test period. Because the technique is easy to use, requires very little time, and detects minor changes, it is recommended as a means of monitoring the subjects in subsequent reduced-pressure-atmosphere closed-chamber tests and space flights. Author

N71-20998*# Naval Medical Research Inst., Bethesda, Md.
BLOOD CARBOXYHEMOGLOBIN SATURATION OF PERSONNEL DURING 90-DAY TEST
F. Lee Rodkey, Harold A. Collison, and John D. O'Neal *In* NASA. Langley Res. Center Prelim. Results from an operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 591 -597 refs (See N71-20951 10-05)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06P

Hemoglobin solutions prepared from blood clots have been used to measure the COHb saturation of crew members during a ninety day test of a simulated space station life support system. The toxin burner was effective in removal of CO from the system as rapidly as it was produced by the crew. During a period of 313 hours when the toxin burner was not operated, a total of 739 ml of CO accumulated in the gas and blood. An average rate of endogenous CO production over this period of 0.59 ml per man hour was calculated. Author

N71-20999*# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
SUMMARY AND CONCLUSIONS
J. K. Jackson and Albin O. Pearson (NASA. Langley Res. Center) *In* NASA. Langley Res. Center Prelim. Results from an Operational 90-Day Manned Test of a Regenerative Life Support System 1971 p 599 -603 (See N71-20951 10-05)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06K

The 90-day manned test of a regenerative life support system has been completed with the accomplishment of the following seven major objectives: (1) the biological and chemical isolation of the space station simulator was maintained; (2) the regenerative life support systems operated effectively in producing potable water, removing atmospheric contaminants, and recovering oxygen from carbon dioxide; (3) provisioning of spares, tools, and expendables permitted mission completion; (4) data were obtained that defined system and subsystem mass and thermal balance and power requirements; (5) all maintenance and repair of the onboard equipment were conducted by the test crew; (6) data on planning and procedures and corresponding crew performance were obtained; and (7) data were obtained on physiological and psychological effects of confinement on the test crew. Author

N71-21041# Army Medical Research Lab., Ft. Knox, Ky.
GROWTH AND RECOVERY OF TEMPORARY THRESHOLD SHIFTS FOLLOWING EXTENDED EXPOSURE TO HIGH LEVEL, CONTINUOUS NOISE Interim Report
James D. Mosko, John L. Fletcher, and George A. Luz 24 Nov. 1970 14 p refs
(AD-717232; USAMRL-911) Avail: NTIS CSCL 6/16

A study was undertaken to evaluate the growth and recovery of temporary threshold shifts produced by extended exposure to simulated armored vehicle noise. Seventeen young adult males were continuously exposed to simulated armored vehicle noise over a 48-hour period. Auditory thresholds were obtained prior to exposure, during exposure, and after termination of exposure in order to permit the plotting of growth and recovery function for temporary threshold shift. Mathematical functions were used to describe the time-course of both the growth and recovery function. The data support the idea that an exponential mathematical function best describes both the growth and recovery functions for the temporary threshold shifts produced in this study. In addition, the data support earlier findings which indicate that an exponential model for temporary threshold shift is perhaps the most applicable model for use in designing dosimeters for noise exposure. Author (GRA)

N71-21061# Naval Aerospace Medical Inst., Pensacola, Fla.
THE NAVAL AVIATORS' SPEECH DISCRIMINATION TEST Progress Report
James W. Greene 29 Jun. 1970 12 p refs
(AD-716766; NAMRL-1110; NAVMED-MF12.524.005-7011B)
Avail: NTIS CSCL 6/16

The document is concerned with the Naval Aviators speech discrimination test (NASDT) which is used to provide an objective basis for granting waivers to senior aviators who fail to meet the pure-tone hearing standards but who experience no hearing difficulties in their working environment. The test is also administered to groups of student aviators and participants in the Pensacola thousand aviator study. From an analysis of the data that have been obtained to date, it appears that the NASDT has fulfilled its original purpose and has led to a more realistic and practical evaluation of the hearing of senior naval aviators. Author (GRA)

N71-21092*# *General Research Corp., Arlington, Va.*
A SURVEY OF APPLICATIONS FOR TECHNOLOGY IN BIOLOGY AND MEDICINE
Richard R. Hibbard Oct. 1970 58 p refs
(Contract NASw-2053)
(NASA-CR-117487; WGRC-70-1953; CR-11180) Avail: NTIS CSCL 06B

An overview is presented of the interdisciplinary research of engineers, life scientists, and physicians. Much of the information presented comes directly from conversations with researchers and reflects what they believe to be the problems of medicine which engineers can aid in solving. Topics were selected to represent both the classes of problems identified and the categories of opportunities for engineering including artificial organs and assistive devices; automation of clinical laboratories; clinical instrumentation; hospital information systems; medical telecommunication; monitoring patients under intensive care; multiphasic screening; and prosthetics, sensory aids, and rehabilitation. Author

N71-21150# Naval Aerospace Medical Inst., Pensacola, Fla.
TWO PROCEDURES FOR APPLIED AND EXPERIMENTAL STUDIES OF STRESS
Robert S. Kennedy Feb. 1970 18 p refs Prepared jointly with Army Aeromed. Res. Lab.
(AD-716967; NAMI-1099; USAARL-70-11) Avail: NTIS CSCL 6/19

To compensate for the low reliability of physiological manifestations of sympathetic nervous system activity two methods are offered. The first method requires a major research program by which a valid criterion of stress would be determined by experimentation, and then predictors of this criterion would be obtained empirically by correlational techniques. These predictors could then be crossvalidated. By using the predictors, the influences of psychological stress and physiological stress could be separated. Whether a functional relationship exists between the magnitude of the response to stress and the probability of its occurrence could then be determined. The second method is similar but less exact. It has been used successfully in motion sickness studies and avoids the necessity of a long exploratory program with numerous pilot studies. A procedure for the control and the regulation of the perception of the magnitude of the stress to the organism (human and infrahuman) is offered for use with the two methods. The lack of suitable control of this factor is discussed in connection with previous research. Author (GRA)

N71-21167# Columbia Univ., New York. Radiological Research Lab.
RESEARCH PROJECT Annual Report
1 Jul. 1970 263 p refs
(Contract AT(30-1)-2740)
(NYO-2740-7) Avail: NTIS

Research in radiophysics, radiobiology, and biophysics is discussed. Dosimetry, microscopic distribution of radiation energy, and multiple Coulomb scattering and electron transport in tissue-equivalent gas mixtures are described. Genetic effects of neutrons and X-rays, relative biological effectiveness studies, theoretical radiobiology, and radiobiological studies with Cf-252 and synchronous cells are also reported. N.E.N.

N71-21207# Picatinny Arsenal, Dover, N.J.
A VISUAL DETECTION AND RECOGNITION THRESHOLD STUDY OF FOUR GEOMETRIC SHAPES
Jack Carlock, Jay C. Rayner, and Bruce L. Bucklin Dec. 1970 47 p
(AD-717004; PA-TM-1956) Avail: NTIS CSCL 6/16

A detection and identification test of four basic geometric shapes was conducted. The test was conducted in two phases. In phase 1 the stimulus objects were painted with an olive green flat latex paint (OG); in Phase 2, after having been so painted, they also were coated with a noncuring silicone-based adhesive. 200 enlisted personnel participated as subjects. The report presents the results of the test. Author (GRA)

N71-21222# California Univ., Los Angeles. Space Biology Lab.
EEG CONCOMITANTS OF EXPOSURE TO OSCILLATING ENVIRONMENTAL ELECTRIC FIELDS Final Report, 1 May 1967–30 Sep. 1970
W. Ross Adey 30 Sep. 1970 161 p refs
(Contract DADA17-67-C-7124)
(AD-717100) Avail: NTIS CSCL 6/16

A series of experiments has been done to assess effects of low-level (2.8 v.p-p. across 40 cm), low-frequency (7 and 10 Hz) electric fields on behavior and electrical brain activity of monkeys. Monkeys were implanted with cortical and subcortical EEG electrodes and then trained to perform a precise behavioral task (a five sec, fixed interval, limited hold scheduling of rewards for lever pressing). After the animals were well trained, they were tested in a set of 4-hour experiments with fields on and fields off. Behavioral inter-response time distributions shifted in the direction of significantly faster responses under the 7 Hz fields. Peaks in power of EEG autospectra were observed at the frequency of the field in certain brain structures, especially the hippocampus. Other experiments evaluated length of exposure to fields, EEG changes with fast and slow responses, effects on sleep patterns and effects on evoked visual responses in cats. EEG was monitored from monkeys during exposure to amplitude modulated (5-15 Hz) and unmodulated microwaves. Results suggested an interaction of modulated microwaves with certain brain structures. However, the question of rectification effects at the electrode-tissue interface was left unanswered. Author (GRA)

N71-21229# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
FUNCTION OF A MAN-MACHINE INTERACTIVE INFORMATION RETRIEVAL SYSTEM Annual Progress Report
John H. Williams, Jr. Oct. 1970 35 p refs
(Contract N00014-70-C-0297)
(AD-716954) Avail: NTIS CSCL 5/2

An effective man-machine interactive retrieval system is not achieved by simply placing a terminal on each end of an existing machine retrieval system. An interactive system requires a sequence of steps in which man and machine alternately take action. It should also provide different levels of services to experienced and inexperienced searches, recognize the difference between a narrow and broad query, furnish clues as to the next direction to be searched, reorganize the data base dynamically as the searcher changes his view-point, providing a ranking of responses in the most likely sequence and offer the searcher the option of overriding the ranking when a particular term is of extreme significance. An online interactive system meeting many of these needs was developed and tested. The objective of the development of this system, BROWSER, was to investigate the effectiveness of a free-form query with a combinatorial search algorithm and the effectiveness of various techniques and components to facilitate online browsing. Author (GRA)

N71-21333 Ohio State Univ., Columbus.
THE EFFECTS OF A SPACE-CABIN ENVIRONMENT ON THE IMMUNE RESPONSE
Robert Vincent Coyne (Ph.D. Thesis) 1969 74 p
Avail: Univ. Microfilms: HC $4.00/Microfilm $3.00 Order No. 70-6752

The effects of a simulated space-cabin atmosphere (100%

oxygen at 5 psia) on the immunological response in mice were investigated. Primary and secondary responses were studied relative to changes in spleen weight, antibody titer and to the histochemical and biochemical activities of oxidative enzymes and acid phosphatase in the spleen following stimulation with killed Brucella abortus antigen. Animals were maintained in normal room atmosphere (room controls), in an environmental dome under normal atmospheric conditions (dome controls) or exposed to 100% oxygen at 5 psia or 7.5 psia in an environmental dome either before or after antigenic stimulation. Dissert. Abstr.

N71-21401 National Lending Library for Science and Technology, Boston Spa (England).

CONCERNING THE POSSIBILITY OF SELF-OSCILLATION ARISING IN ENZYMIC REACTIONS WITH SUBSTRATE AND PRODUCT INHIBITION [O VOZMOZHNOSTI VOZNIKNOVENIYA AVTOKOLEBANII V FERMENTATIVNYKH REAKTSIYAKA A SUBSTRATNYM I PRODUKTNYM UGNETENIYAMI]

E. E. Selkov Aug. 1970 22 p refs Transl. into ENGLISH from the Publ. 'Kolebatelnye Protsessy v Biolog. i Khim. Istemakh, VSES Simpoziuma, 21 – 26 March 1966' Moscow, 1967 p 93 – 112
(NLL-RTS-5991) Avail: Natl. Lending Library, Boston Spa, Engl.: 44s; 7 NLL photocopy coupons

A kinetic model is described for open monomolecular reactions, the enzyme for which is inhibited simultaneously by the substrate and the product. In reactions which correspond to this model, mathematical analysis shows that self-oscillation of the reagent concentration must occur under certain conditions. The model is useful in explaining the periodical processes which are frequently observed in various biochemical processes. Author

N71-21472# Joint Publications Research Service, Washington, D.C.

PHYSIOLOGICAL CHANGES IN DIVERS WORKING UNDERWATER

S. A. Gulyar et al 23 Mar. 1971 9 p refs Transl. into ENGLISH from Fiziol. Zh. (Kiev),
(JPRS-52697) Avail: NTIS

Respiration, blood circulation, and energy functions were measured on divers wearing aqualungs and working in an underwater drilling facility to investigate work-rest cycles. Subjects were eight healthy males aged 19 to 30 who performed the following tasks: equipment operating, rod replacement, disconnecting ground probes, drilling using an air hammer and crow bar, and connecting and disconnecting hoses and pipes. Results reveal that underwater drilling work in a low temperature environment brings about significant changes in the circulatory and respiratory systems and the thermoregulation mechanism. Tasks are more difficult to perform than on land. A 15-minute rest period after work does not fully restore physiological functions to normal levels. E.C.

N71-21485# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

UTILIZATION OF COHERENT OPTICS IN THE OPTIMIZATION OF RECOGNITION

Kenneth G. Leib and Benjamin J. Pernick Mar. 1971 80 p refs
(RM-498) Avail: NTIS

The premise that certain coherent optical systems are capable of directly linking together the visual response of the human eye and visual stimuli is studied. The hypothesis is that by matching the spatial frequency response of the eye of an observer to the optical frequency spectrum of the visual pattern observed, recognition will be optimized for that observer. The ability to distinguish between visual symbols and to measure the level of similarity could also be achieved. This quantitative measurement would be derived from laboratory findings rather than from statistical subject test evaluations. Pertinent characteristics of coherent optical correlation and frequency analysis as applied to the human eye are discussed. Applications of these techniques to the improvement of display legibility and to education research in reading are presented. Pilot psychological tests with a small adult sample have shown that such laboratory measurements are meaningful and could be used to predict human factors test results in similar applications. A collection of optical spatial frequency patterns for some basic geometric shapes and alphanumeric codes is included. Author

N71-21486# Stanford Research Inst., Irvine, Calif. Southern California Labs.

FEASIBILITY INVESTIGATIONS OF ELECTROSTATIC PRECIPITATION FOR THE REMOVAL OF GASEOUS TRACE CONTAMINANTS FROM MANNED CABIN ATMOSPHERES Final Report, 1 Oct. 1968 – 15 April 1970

George J. Doyle, Robert Weaver, and Quentin McKenna Oct. 1970 38 p refs
(Contract F33165-69-C-1047)
(AD-716864; AMRL-TR-70-73) Avail: NTIS CSCL 6/11

The feasibility of electrostatic precipitation of clustered lithium ions for removal of gaseous trace contaminants from atmospheres could not be demonstrated under the constraints imposed on the experimental work. The major difficulty was that the thermionic source cause oxidation of the contaminants (acetone, methanol, and propane at 1-25 ppm concentration). The source was designed to minimize thermal effects such as oxidation and consume about the minimum practical heating power density to produce the necessary ion current in atmospheres near 760 torr pressures. Even at trace concentrations of oxygen in nitrogen, the oxidation rates were sufficient to obscure any possible precipitation effects. Author (GRA)

N71-21509*# California Univ., Berkeley. Lawrence Radiation Lab.

OBSERVATIONS BY HUMAN SUBJECTS ON RADIATION-INDUCED LIGHT FLASHES IN FAST-NEUTRON, X-RAY, AND POSITIVE-PION BEAMS

C. A. Tobias, T. F. Budinger, and J. T. Lyman Aug. 1970 16 p
(NASA Order L-43541; Contract W-7405-eng-48)
(NASA-CR-U7495; UCRL-19868) Avail: NTIS CSCL 06P

In order to examine the hypothesis that light flashes seen by astronauts on lunar missions are the result of primary cosmic particles, two human subjects were exposed to a fast-neutron beam (20 MeV to 640 MeV) at the Berkeley 184-inch cyclotron. Both subjects saw 25 to 50 discrete pinpoint bright momentary light flahses in response to a flux of (10 to the 4th power per square centimeter per second) (1 mrem dose). The star-like phosphene phenomenon in the neutron exposure is different from X-ray induced radiophosphenes and from electrically produced visual flashes. No visual phenomenon was noted on positive pi meson exposure at 200 neutrons (per square centimeter per second). It is believed that bright flashes seen by astronauts are from primary cosmic particles traversing the retina. The mechanism is probably ionization, although light from Cherenkov effect has not been ruled out. Author (NSA)

N71-21510*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SUMMARY OF TESTING FOR TRACE CONTAMINANTS IN THE BIOSATELLITE 3 SPACECRAFT ATMOSPHERE

Lou S. Young Oct. 1970 95 p refs
(NASA-TM-X-62004) Avail: NTIS CSCL 06A

Biosatellite 3 was the first U.S. spacecraft to maintain a normal earth atmosphere for its biological-specimen payload. Preflight ground tests showed that the spacecraft atmosphere

contained undesirable trace contaminants. Strict control was imposed over the introduction of nonmetallic materials and the use of solvents in and around the flight spacecraft cabin and its components. External ambient atmospheres were also controlled. A series of tests verified that the resulting atmosphere was safe for long-term occupancy by the experimental animal. The atmosphere of the recovered Biosatellite 3 contained higher levels of a few contaminants than were detected in the preflight tests, and the ammonia and aldehyde levels were especially high; but none of the contaminants are thought to have reached toxic concentrations. Author

N71-21526# Argonne Cancer Research Hospital, Chicago, Ill.
EFFECTS OF HYPERTROPHY AND HYPOXIA ON THE TURNOVER OF MYOCARDIAL COMPONENTS
Murray Rabinowitz, Radovan Zak, Vaclav Aschenbrenner, and R. Albin 1970 28 p refs Presented at Symp. on Cardiac Hypertrophy, Bratislava Sponsored in part by AEC and Chicago and Ill. Heart Assoc.
(Grants PH-43-68-133; HE-9172; HE-4442)
(ACRH-1000-214; CONF-700936-1) Avail: NTIS

It is shown that myofibrillar proteins and mitochondrial components turn over rapidly within the cardiac muscle cell. Myofibrillar proteins and the inner mitochondrial membrane each appear to turn over synchronously. Acute cardiac hypertrophy results in increased synthesis of these components but mitochondrial mass increases disproportionally greater than other cell proteins early in the process. The rate of myosin destruction is decreased after aortic constriction. Similarly the increase in mitochondrial mass caused by thyroid administration is accompanied by a decreased mitochondrial turnover. However immediately after aortic constriction there may be a considerable increase in mitochondrial turnover during the phase of rapid synthesis. Hypoxia leads to a selective destruction of mitochondria, which are rapidly resynthesized following return to normal oxygen tension. Myofibrils and membranes are more resistant than mitochondria to the effect of hypoxia. Author

N71-21527# Oregon State Univ., Corvallis. Dept. of Biochemistry and Biophysics.
PROPERTIES OF ENZYMES FROM THERMOMORPHS AND HALOPHILES Progress Report, 1 Apr. 1968 - 15 Dec. 1970
R. R. Becker 15 Dec. 1970 14 p refs
(Contract AT(45-1)-2059)
(RLO-2227-T-5-1) Avail: NTIS

Research is reported on enzymes from H. salinarium, B. stearothermophilus, and Vibrio marinus. By including Mn(2+) in the isolation procedure, it was possible to isolate small quantities of alkaline phosphatase of H. salinarium. Difficulties in purifying and characterizing enzymes from B. stearothermophilus and Vibrio marinus are briefly described, and the present state of knowledge in the area of thermophilic proteins is reviewed. N.E.N.

N71-21535# California Univ., Livermore. Lawrence Radiation Lab.
SPECTRA OF THE PHOTOCONDUCTIVITY OF GREEN LEAVES AND CHLOROPLASTS AT A FREQUENCY OF 10 TO THE 10th POWER CYCLES PER SECOND
L. A. Blyumenfeld et al Oct. 1970 6 p refs Transl. into ENGLISH from Dokl Akad. Nauk SSSR (Moscow), v. 193, 1970 p 700 - 702 In ENGLISH and RUSSIAN Sponsored by AEC
(UCRL-Trans-1427) Avail: NTIS

In order to understand the mechanism of the light stage of photosynthesis, it is necessary to establish if such charges actually form in photosynthesizing systems. The most direct answer to this question can be given by measurements of photoconductivity at such frequencies at which the diffusion displacement of the photocarriers for the field period is small in comparison with the dimensions of the conductive areas. This requirement is satisfied by a range of 10 to the 10th power cycles per second. The measuring of photoconductivity at superhigh frequencies consists in determining the imaginary part of the dielectric constant of a sample under light. The system of automatic frequency control which compensates for the shifting of the resonator's own frequency under light makes it possible to measure separately the imaginary part of the dielectric constant. Author

N71-21558*# North American Rockwell Corp., Downey, Calif. Space Div.
A STUDY OF HUMAN PERFORMANCE IN A ROTATING ENVIRONMENT
J. A. Green, J. L. Peacock, and A. P. Holm 1970 245 p refs
(Contract NAS1-9711)
(NASA-CR-111866; SD-70-456) Avail: NTIS CSCL 05E

The overall impact of artificial-gravity simulations on potential design configurations and crew operational procedures is discussed. Gross locomotion and fine motor performance were evaluated at rotational rates of 3, 4, and 5 rpm, at selected radii between 0 and 78 feet. The test series consisted of 12 one-day, 1 three-day, and 1 seven-day test. Results of these evaluations indicate that crew orientation, rotational rates, vehicle design configurations, and operational procedures may be used to reduce the severity of the adverse effects of the Coriolis and cross-coupled angular accelerations acting on masses moving within a rotating environment. Results further indicate that crew selection, motivation, and short-term exposures to the rotating environment may be important considerations for future crew indoctrination and training programs. Author

N71-21576# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
EXTERNAL SPACECRAFT CONTAMINATION MODELING AND COUNTERMEASURES
T. Baurer, M. H. Bortner, I. M. Pikus, and A. M. Cooper Jun. 1970 85 p refs
(Rept-70SD260) Avail: NTIS

The causes and counteractions for spacecraft external contamination are discussed. The relevant phenomenology may be conceptualized in a model which assumes that a mass transfer mechanism is operative, including sources, transport modes, and sinks. Typical sources include engine debris, jettisoned wastes, outgassing, and cabin leakage. Three complementary approaches to the problem of counteracting contamination are presented. Author

N71-21598*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
DYNAMIC MODELS OF THE HUMAN BODY Technical Report, Sep. Sep. 1962 - Feb. 1964
Ernest L. Stech and Peter R. Payne Wright-Patterson AFB, Ohio AMRL Nov. 1969 59 p Prepared by Frost Eng. Develop. Center
(Contract AF 33(657)-9514)
(NASA-TM-X-67038; AD-701383; AMRL-TR-66-157) Avail: NTIS CSCL 6/2

Some of the dynamic characteristics of the human body were analyzed and mathematically analogs that can be used to predict the response of the body to acceleration environments were developed. The background of the acceleration tolerance problem, the basic concepts of body dynamics and the available experimental data were also reviewed. Both spinal and transvers dynamic models are presented together with the data used in obtaining frequency, damping, and breaking strength estimates. A discussion of the factors influencing the production of injury from exposure to accelerations is presented to indicate the difficulty in defining human tolerance to acceleration using the classical approach of

graphs or simple critical G values that depend only upon the duration of the acceleration. The concept of relative probability of injury is developed in order to take into account the variations in the human structure and other factors that influence human tolerance to accelerations. Author (GRA)

N71-21601# California Univ., Livermore. Lawrence Radiation Lab.

FORTRAN CODE FOR THE ANALYSIS OF COUNTING DATA FROM ANIMAL TISSUES

W. H. Martin, D. G. Fleshman, and A. J. Silva 16 Oct. 1970 28 p refs Sponsored by AEC

(UCRL-50957) Avail: NTIS

A Fortran code designed to run under the monitor system of the CDC 6600 computer was developed for processing counting data from studies involving the metabolism of radionuclides in animals. The mathematics and input parameters necessary to reduce these data are presented. The program applies calculations required to derive uptake, retention, distribution, and excretion data from animals which were administered radionuclides. Author (NSA)

N71-21610# Joint Publications Research Service, Washington, D.C.

PHYSICOCHEMICAL SIMULATION OF PROCESSES OF INFORMATION AND THINKING

N. I. Kobozev 25 Mar. 1971 12 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (Moscow), v. 44, no. 12, 1970 p 2969 - 2974

(JPRS-52722) Avail: NTIS

In terms of the thermodynamics of strongly degenerate Fermi-Dirac gas, a low-entropy system of superlight particles was calculated, capable of producing with a small degree of error some prelogical informational functions of the brain and consciousness (under normal temperature). The superlight particles are actually fermions with low intraparticle density. Even at a low concentration they can create in the nerve cell network a low-entropy information apparatus capable of allowing less than one error in 1,000 operations. The small mass of the particles determines their great phase wave as well as their time variable ambiguity. This makes it possible for microparticles to absorb the flow of information earlier in time and farther in space than the biochemical cell material is able to. Without such an informational lead, living cells could not endure the competition against a mass of dead substance. Author

N71-21621# Texas Univ., Austin. Electronics Research Center.

EVOKED POTENTIALS FROM THE LASER-IRRADIATED RETINA

Franklin G. Hempel and Ashley J. Welch 20 Mar. 1970 170 p refs

(Contract DAAB07-68-C-0319; Grant AF-AFOSR-1792-69)

(AD-717166; TR-83; AFOSR-70-1872TR) Avail: NTIS CSCL 6/3

The document is concerned with the effect of retinal photocoagulation on the light evoked electrical responses of the visual system. Research was conducted to examine the electroretinogram (ERG) and the lateral geniculate nucleus (LGN) and striate cortex potentials of the rabbit before and after irradiation of the retina with a high-energy ruby laser. Protocol consisted of recording the three potentials while stimulating the eye with an argon laser operated at several flash intensities, exposing the retina to a calculated ruby laser radiation dosage, and recording again the responses to photic stimulation. Author (GRA)

N71-21640# Federation of American Societies for Experimental Biology, Bethesda, Md.

EFFECT OF GRAVITATIONAL OVERLOADS ON INNERVATION OF THE AORTA, VENAE CAVAE, AND ATRIA

M. G. Prives et al 1971 9 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i, Embriol. (Moscow), v. 58, n. 5, 1970

(PB-197016T; NS-362) Avail: NTIS CSCL 06S

Investigations have demonstrated structural changes in blood vessels exposed to gravitational overloads in various directions. Changes observed in the vessels and their walls are unquestionably accompanied by morphological changes in their neutral components. The results of an investigation of nerve endings in the atria, aorta, and venae cavae are described and correlated with the degree of physiological stress on the cardiovascular system during exposure to continuously increasing centrifugal acceleration. Material for investigation was obtained for 19 dogs in four series of experiments. GRA

N71-21641# Epoxylite Corp., South El Monte, Calif.

DEVELOPMENT OF SATISFACTORY LONG TERM PERCUTANEOUS LEADS Final Report, 9 Jun. 1967 - 24 Oct. 1969

Henry L. Lee, Jr., David E. Ocumpaugh, Arthur L. Cupples, and Gordon W. Culp Apr. 1970 346 p refs

(Contract PH-43-67-1108)

(PB-196985; RR-70-118) Avail: NTIS HC $6.00/MF $0.95 CSCL 06L

A percutaneous lead was developed which features a central percutaneous, cylindrical conduit with an exterior flange and a subcutaneous fenestrated skirt. The flange prevents overgrowth of the conduit, while the skirt provides immobilization when connective tissue invades the fenestration. Animal experiments, including 88 leads in 23 dogs, 16 leads in 6 monkeys, and 10 leads in 4 pigs, were performed using 12 different materials of construction and 28 variations of configuration. Satisfactory lead performance is characterized by absence of serious weeping despite induced trauma by the free-ranging animal, continuous exposure to ubiquitous vivarium organisms, and externally applied broths of virulent bacteria. Author (GRA)

N71-21649# Bell Aerosystems Co., Buffalo, N.Y.

RESEARCH ON THE CLASSIFICATION OF STATISTICALLY AND GRAPHICALLY DEFINED PATTERNS Final Report

Lester A. Gerhardt and Kenneth W. Drake 10 Dec. 1970 52 p refs

(Contract AF 49(638)-1627)

(AD-717219; BA-9500-920196; AFOSR-70-2929TR) Avail: NTIS CSCL 9/2

Improved target detection and classification capability is the aim of the report. Two types of target clues or features are considered, spectral and spatial. The emphasis is placed on using automatic means for performing the detection with the classification being performed by a human operator. For the spectral clues, a statistical model was used to aid in the classification of spectral signatures. For the near IR and video region, a six dimensional space was sufficient for most problems. Results are given for a set of actual data covering seven different classes. Approaching the detection problem as a separate entity, optimized preprocessing spectral filters are developed. Binary filters which are proven to also be optimum are derived and an algorithm for finding them is given. Author (GRA)

N71-21650# Naval Aerospace Medical Inst., Pensacola, Fla. Research Lab.

RELIABILITY AND VALIDITY OF THE BRIEF VESTIBULAR DISORIENTATION TEST COMPARED UNDER 10 rpm AND 15 rpm CONDITIONS

Rosalie K. Ambler and Fred E. Guedry, Jr. 14 Aug. 1970 14 p refs Joint Army-Navy report

(AD-716767; NAMRL-1115; USAARL-71-7) Avail: NTIS CSCL 6/16

A Brief Vestibular Disorientation Test (BVDT) was developed that involves observer assessment of subjects reactions produced by head movements in a rotating chair. Reliability of observers has been demonstrated, and significant validation and cross-validation coefficients have been reported for criteria of pass versus various types of separations from pilot training. It has also been established that the BVDT score significantly augmented the multiple correlation of existing aviation selection variables with the same criteria. The purpose of this study was to determine if reliability, validity, and augmentation of correlation could be obtained with less disturbance to the subject than that caused by the 15-rpm speed of rotation used thus far in the BVDT. Reduced disturbance and aftereffects are desired because the BVDT is now envisioned as becoming part of the entering flight physical, and procedures that might either impair performance on the other tests or require recovery periods must be held at a minimum. The BVDT procedure used here was identical to two previous studies except that a speed of 10-rpm was used instead of 15-rpm. Subjects were 157 flight students who were tested within the first four days of reporting for training. It was concluded, that the 10-rpm BVDT was a feasible procedure. It was also concluded that, because the mean score for the 10-rpm group was lower than the mean for either of the two 15-rpm groups used previously, subject disturbance had been reduced. Author (GRA)

N71-21683# Kansas State Univ., Manhattan. Water Resources Research Inst.

WATER UTILIZATION ASPECTS OF WEATHER MODIFICATION AS APPLIED TO KANSAS Completion Report, 1 Jul. 1968 – 1 May 1970

Robert L. Smith Nov. 1970 72 p refs Prepared in cooperation with Kansas Univ., Lawrence *Its* Contrib No. 46

(Contract Di-14-01-0001-1635)

(PB-196310; OWRR-A-023-KAN-1) Avail: NTIS CSCL 08H

A digital model of the land phase of the hydrologic cycle is utilized to determine the probable response of Kansas streams to various patterns of rainfall augmentation. Seven test basins, representing a broad range of climatic conditions, are analyzed. Comparative analysis of the results of simulations performed for historic and augmented patterns indicates runoff response would be most sensitive to changes in the precipitation pattern. In Kansas, the percentage increase in average streamflow will be approximately four times the percentage increase in average precipitation-assuming uniform augmentation of the historic pattern. Justification for a statewide program of precipitation augmentation in Kansas would have to be highly dependent on benefits to dry land agriculture. An empirical relationship for determining the percentage gain in average runoff to be realized under conditions of uniformly augmented precipitation is presented. GRA

N71-21684# Bureau of Radiological Health, Rockville, Md. Office of Regional Operations.

THE SECOND ANNUAL NATIONAL CONFERENCE ON RADIATION CONTROL: THE QUEST FOR QUALITY

Oct. 1970 371 p refs Conf. held at Palm Beach, Fla., 26 – 29 Apr. 1970

(PB-196444; BRH/ORO-70-5) Avail: NTIS HC $6.00/MF $0.95 CSCL 06R

The conference concentrated on three major problem areas in radiological health: (1) public exposure to X radiation, (2) improving the qualifications of radiation users, and (3) environmental radiation around nuclear facilities. In addition to formal presentations by state, local and federal representatives, Committees of the Conference of Radiation Control Program Directors met and reported on specific radiation control programs. Author (GRA)

N71-21710# Atomic Energy Commission, New York. Health and Safety Lab.

FALLOUT PROGRAM Quarterly Summary Report, 1 Jun. – 1 Sep. 1970

Edward P. Hardy, Jr. 1 Oct. 1970 117 p refs

(HASL-237) Avail: NTIS

The results of the Health and Safety Laboratory (HASL) fallout investigation project are reported. Subjects discussed are: (1) strontium(90) accumulation in Colorado, (2) strontium(90) deposition in Atlantic Ocean, (3) observed concentrations of nuclides in the stratosphere compared with predictions by the streak model, (4) fallout monitoring in Italy, and (5) cesium and potassium concentrations in bulk food samples in Chicago, Illinois. Author

N71-21713# Joint Publications Research Service, Washington, D.C.

SOME HYDRODYNAMIC ASPECTS OF THE MOVEMENT OF CILIARY INFUSORIA

L. N. Seravin 10 1971 8 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Biol. (Leningrad), no. 21, Ser. no. 4, 1970 p 41 – 47

(JPRS-52581) Avail: NTIS

The manner in which ciliary infusoria are propelled in a hydraulic medium is discussed. The following conclusions are presented: (1) the movement of ciliary infusoria is possible due to a system of vortical currents of liquids which are produced by the ciliary system, (2) the movement and rotation of the ciliary infusoria depends little on the body shape, (3) the infusoria change direction by regulating the direction of rotation and movement of overall flow of the liquid, and (4) the shape and character of the infusoria motions are affected by retarding or heightening the work of various parts of the ciliary cover. Author

N71-21725# Joint Publications Research Service, Washington, D.C.

FREQUENCY SPECTRUM OF SPEECH AS AN INDICATOR OF THE DEGREE AND NATURE OF EMOTIONAL STRESS

V. A. Popov et al 23 Mar. 1971 8 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatel'nosti (Moscow), no. 1, 1971 p 104 – 109

(JPRS-52698) Avail: NTIS

Tie possibility of using the formant frequency of speech signals to evaluate the degree of emotional stress in human subjects is presented. The frequency regions of the peaks observed on the spectral picture of speech sounds are called formant zones or simply formants. The location of the spectral peaks corresponds more or less to the resonances of the speech tract. One of the principal characteristics of the spectrum of speech sounds is the number of formants and their distribution in the frequency region. During emotional stress, the formants are displaced or deformed thus producing an indication of the emotional intensity. Author

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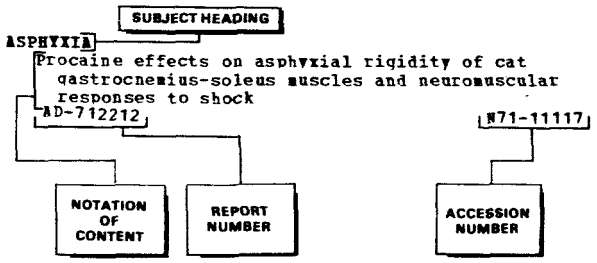

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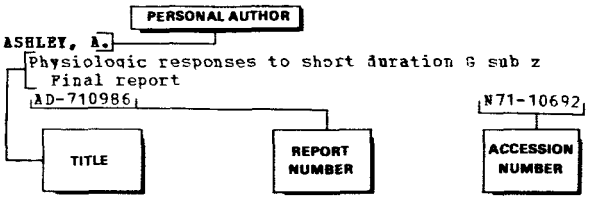

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